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Geology of

Carbonatite – Alkalic Rock Complexes in Ontario:

Schryburt Lake Carbonatite Complex

District of Kenora

Ontario Geological Survey
Study 50

by R. P. Sage

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Foreword

The Schryburt Lake Carbonatite Complex was examined as part of a project to study alkalic rock – carbonatite complexes in Ontario. The study describes the rock types and mineralogy of the complex and outlines the history of the mineral exploration efforts within the complex.

V.G. Milne

Director
Ontario Geological Survey

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CONVERSION FACTORS FOR MEASUREMENTS IN ONTARIO GEOLOGICAL SURVEY PUBLICATIONS

Conversion from SI to Imperial			Conversion from Imperial to SI		
SI Unit	*Multiplied by*	*Gives*	*Imperial Unit*	*Multiplied by*	*Gives*
		LENGTH			
1 mm	0.039 37	inches	1 inch	**25.4**	mm
1 cm	0.393 70	inches	1 inch	**2.54**	cm
1 m	3.280 84	feet	1 foot	**0.304 8**	m
1 m	0.049 709 7	chains	1 chain	20.116 8	m
1 km	0.621 371	miles (statute)	1 mile (statute)	**1.609 344**	km
		AREA			
1 cm^2	0.155 0	square inches	1 square inch	**6.451 6**	cm^2
1 m^2	10.763 9	square feet	1 square foot	**0.092 903 04**	m^2
1 km^2	0.386 10	square miles	1 square mile	2.589 988	km^2
1 ha	2.471 054	acres	1 acre	0.404 685 6	ha
		VOLUME			
1 cm^3	0.061 02	cubic inches	1 cubic inch	**16.387 064**	cm^3
1 m^3	35.314 7	cubic feet	1 cubic foot	0.028 316 85	m^3
1 m^3	1.308 0	cubic yards	1 cubic yard	0.764 555	m^3
		CAPACITY			
i L	1.759 755	pints	1 pint	0.568 261	L
1 L	0.879 877	quarts	1 quart	1.136 522	L
1 L	0.219 969	gallons	1 gallon	**4.546 090**	L
		MASS			
1 g	0.035 273 96	ounces (avdp)	1 ounce (avdp)	28.349 523	g
1 g	0.032 150 75	ounces (troy)	1 ounce (troy)	**31.103 476 8**	g
1 kg	2.204 62	pounds (avdp)	1 pound (avdp)	**0.453 592 37**	kg
1 kg	0.001 102 3	tons (short)	1 ton (short)	**907.184 74**	kg
1 t	1.102 311	tons (short)	1 ton (short)	**0.907 184 74**	t
1 kg	0.000 984 21	tons (long)	1 ton (long)	**1016.046 908 8**	kg
1 t	0.984 206 5	tons (long)	1 ton (long)	**1.016 046 908 8**	t
		CONCENTRATION			
1 g/t	0.029 166 6	ounce (troy)/ ton (short)	1 ounce (troy)/ ton (short)	34.285 714 2	g/t
1 g/t	0.583 333 33	pennyweights/ ton (short)	1 pennyweight/ ton (short)	1.714 285 7	g/t

OTHER USEFUL CONVERSION FACTORS

1 ounce (troy) per ton (short)	20.0	pennyweights per ton (short)
1 pennyweight per ton (short)	0.05	ounces (troy) per ton (short)

Note: Conversion factors which are in bold type are exact. The conversion factors have been taken from or have been derived from factors given in the Metric Practice Guide for the Canadian Mining and Metallurgical Industries, published by the Mining Association of Canada in cooperation with the Coal Association of Canada.

Geology of
Carbonatite – Alkalic Rock Complexes in Ontario:
Schryburt Lake Carbonatite Complex
District of Kenora

R.P. Sage[1]

1. Geologist, Precambrian Geology Section, Ontario Geological Survey, Toronto. Manuscript approved for publication by John Wood, Chief Geologist, Ontario Geological Survey, April 25, 1983.

This report is published with the permission of V.G. Milne, Director, Ontario Geological Survey.

Abstract

The Schryburt Lake Carbonatite Complex occurs within the Gods Lake Subprovince of the Superior Province of the Canadian Shield. The complex may have been emplaced along northwest–trending fractures but geological and geophysical data supporting this interpretation are lacking. The complex consists of sovite and silicocarbonatite and has been dated by K–Ar techniques at 1145 ± 74 Ma. The intrusion is known to contain niobium, uranium and apatite mineralization and warrants much additional work.

Résumé

Le complexe de carbonatite du lac Schryburt est situé dans la sous–province du lac Gods, dans la province Supérieure du bouclier canadien. Il est possible que le complexe soit situé le long de fractures orientées vers le nord–ouest, mais on ne dispose pas de données géologiques et géophysiques appuyant cette interprétation. Le complexe est formé de sovite et de silicocarbonatite et, d'après les techniques de datation au K–Ar, son âge serait de 1145 ± 74 Ma. On sait que l'intrusion contient du niobium, de l'uranium et une minéralisation d'apatite. Elle devrait faire l'objet d'une étude plus approfondie.

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Introduction

The Schryburt Lake Carbonatite Complex was examined as part of a province–wide program to document the mineral potential of alkalic rock – carbonatite intrusions. The complex lies within the Gods Lake Subprovince of the Superior Province of the Canadian Shield and has been isotopically dated using K–Ar techniques at 1145 ± 74 Ma (K. Bell and D. Watkinson, Carleton University, personal communication, 1977). The complex consists of two rock types: sovite, containing more than 50% carbonate, and silicocarbonatite, containing less than 50% carbonate.

The lack of outcrop and meagre bedrock exposed during exploration activities prevented subdivision of the complex into lithologic units. Many Lakes Exploration Company Limited confirmed the presence of niobium, the author confirmed the presence of uranium, and International Minerals and Chemical Corporation encountered residual apatite accumulations in one area of the complex.

The complex warrants examination for vermiculite and rare earths that could also be present within the apatite. The complex warrants additional testing for all mineral commodities typically found within carbonatite complexes.

Acknowledgments

In 1976 the author was assisted in mapping the Schryburt Lake Carbonatite Complex by Mr. William Wright, senior geological assistant. Mr. P. Chamois and Mr. C. Higgins, geological assistants, aided the author and Mr. Wright. In 1988, the statistical compositions of the lithologic units were recalculated by Mr. A. Lisowyk.

Air support for the mapping program was supplied by Severn Enterprises Limited of Pickle Lake. Mr. R.M. Grogan, E.I. Du Pont De Nemours and Company Incorporated, supplied to the Ministry data resulting from work completed on the complex in 1961.

Dr. George Erdosh of International Minerals and Chemical Corporation Limited discussed the results of the company's work on the Schryburt Lake Carbonatite Complex with the author.

Mr. Carl Higgins (1977) completed a B.Sc. thesis, using samples collected during the present project.

Location and Access

The Schryburt Lake Carbonatite Complex (Figure 1) is located at approximately 52°37'N Latitude and 89°37'W Longitude, immediately west of Schryburt Lake. Schryburt Lake is located approximately 128 km northeast of Pickle Lake and is easily accessible by float–equipped aircraft. The complex is indicated by a prominent circular aeromagnetic anomaly (ODM–GSC 1960). The area of the anomaly, combined with very limited outcrop, suggests that the complex has a surface area of approximately 4.5 km² (*see* Figure 2).

Field Methods

Airphotos at a scale of 1:63 360 covering the Schryburt Lake Carbonatite Complex were obtained from the National Airphoto Library, Ottawa. Traverses were

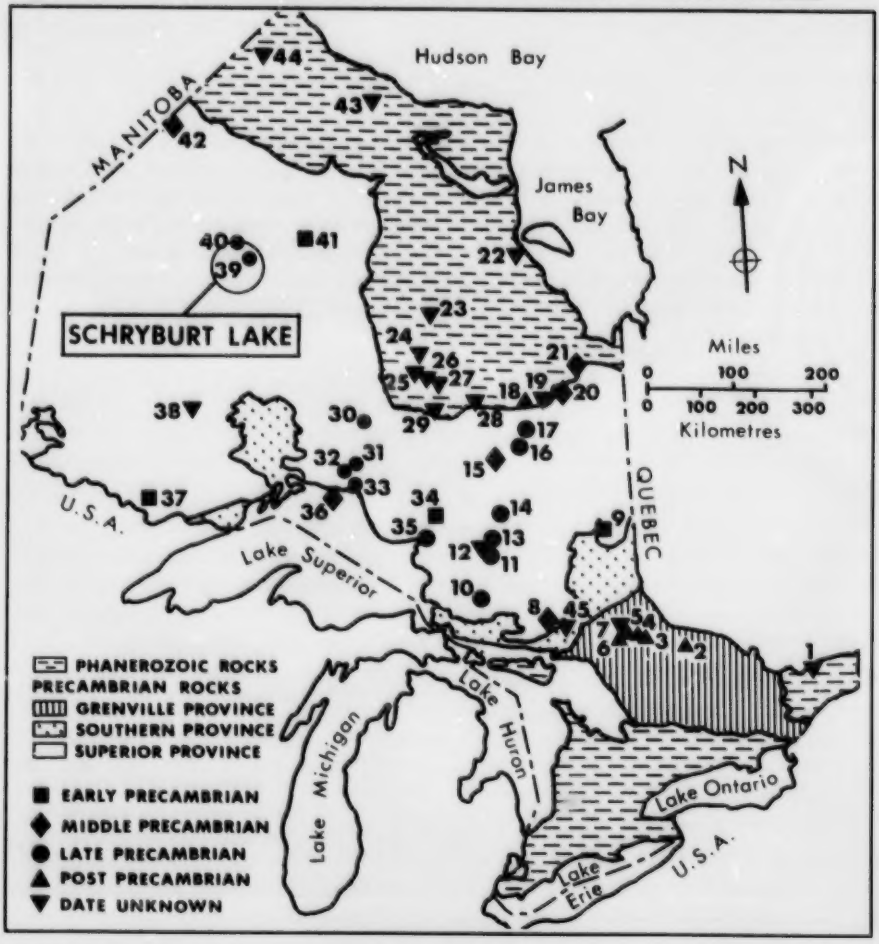


Figure 1. *Key map showing location of carbonatite - alkalic rock complexes in Ontario.*

1. *Eastview*
2. *Brent*
3. *Callander B.*
4. *Manitou Is.*
5. *Burritt Is.*
6. *Iron Is.*
7. *Lavergne*
8. *Spanish R.*
9. *Otto Stock*
10. *Seabrook L.*
11. *Lackner L.*
12. *Borden Tp.*
13. *Nemegosenda L.*
14. *Shenango Tp.*
15. *Cargill Tp.*
16. *Teetzel Tp.*
17. *Clay-Howells*
18. *Hecla-Kilmer*
19. *Valentine Tp.*
20. *Goldray*
21. *Argor*
22. *Lawashi R.*
23. *Poplar R.*
24. *Albany Forks*
25. *L. Drowning R.*
26. *Kingfisher R. West*
27. *Kingfisher R. East*
28. *Martison L.*
29. *Nagagami R.*
30. *Chipman L. (dikes)*
31. *Killala L.*
32. *Prairie L.*
33. *Port Coldwell*
34. *Herman L.*
35. *Firesand R.*
36. *Slate Is.*
37. *Poohbah L.*
38. *Sturgeon Narrows & Squaw L.*
39. **Schryburt L.**
40. *Big Beaver House*
41. *Wapikopa L.*
42. *"Carb" L.*
43. *Gooseberry Br.*
44. *Niskibi L.*
45. *Nemag L. & Lusk L.*

completed across all ridges and hummocks found within the area outlined by the circular aeromagnetic anomaly and the data was plotted on acetate overlays on the airphotos. Traverse and airphoto interpretation were transferred to a blank sheet of cronaflex at a scale of 1:15 840. Maps and the former grid system of Many Lakes Exploration Company Limited were of considerable aid in mapping the complex. The data of Many Lakes Exploration Company Limited and International Minerals and Chemical Corporation (Canada) Limited were transferred to the blank cronaflex in preparing the final map.

Previous Geological Work

The author prepared a brief summary of the Schryburt Lake Carbonatite Complex for Operation Winisk (Thurston *et al.* 1979). The Many Lakes Exploration Company Limited prospected the complex for niobium in 1961 (Parsons, 1961a,b). The International Minerals and Chemical Corporation (Canada) Limited tested the complex for residual apatite accumulations (Erdosh 1977). The preliminary map prepared in 1976 was published in 1979 (Sage and Wright 1979).

Physiography

Outcrop on the carbonatite complex is nonexistent and mapping of the complex is limited to areas of regolith soil where pitting can recover more resistant rock samples supposedly representative of the underlying rock. At the rapids on the creek flowing north from Schryburt Lake, frost–heaved slabs of fresh carbonatite are present which can be sampled with little difficulty. The surface of the complex is low and rolling and consists of elongated, rounded ridges of gravel and boulders separated by low marshy ground.

Two outcrops of banded, granitic gneiss were located on the south side of Schryburt Lake and presumably the complex was emplaced into rocks of this type. Two outcrops of fenitized and carbonate–veined granitic rock are present on the north flank of the complex.

Laboratory Techniques

Samples were collected from the test pits of Many Lakes Exploration Limited and from frost–heaved slabs in the bed of Schryburt Creek. The freshest material was selected for thin sectioning and all fresh homogeneous rock samples were submitted for complete rock analysis. The restriction of sampling to such a limited area of the complex makes the observations and conclusions of this report tentative, pending future work on the body.

Nomenclature

The author uses the following terms to describe the carbonatite rocks.

Sovite: An carbonatite rock composed of 50% or more calcite. Various mineralogical modifiers are used to classify the sovite.

Silicocarbonatite: A carbonatite rock composed of 50% or more oxide and silicate minerals. Where the silicate mineralogy exceeds 90%, various other rock names are applied, i.e. ijolite, biotitite, pyroxenite, etc.

Rauhaugite: Dolomitic equivalent of sovite as defined by Heinrich (1966, p.12).

The definitions of sovite and silicocarbonatite are modified from Heinrich (1966, p.12). The author has found Heinrich's subdivision of the carbonate–rich

carbonatitic rocks generally suitable for field mapping if modified to a two–fold subdivision at about 50% oxide and silicate mineral contents. The two–fold subdivision is more convenient than the four–fold subdivision of Heinrich (1966) because carbonatites are extremely variable in mineral content over distances of less than a few centimetres. It is difficult to rigorously classify such heterogeneous rocks and they are not mappable at any convenient map scale.

General Geology

The Schryburt Lake Carbonatite Complex (Table 1, Figures 2, 3) lies within the Gods Lake Subprovince of the Superior Province of the Canadian Shield. The complex has been dated using K–Ar isotopic techniques at 1145 ± 74 Ma (K. Bell and D. Watkinson, Carleton University, Ottawa, personal communication, 1977). Aeromagnetic maps of the region suggest that its emplacement may have been controlled by a northwest–trending fracture system (ODM–GSC 1970).

Samples collected from the pits and trenches indicate the complex is composed predominantly of sovite (calcitic carbonatite). Subvertical bands of nearly pure sovite alternate with bands of silicocarbonatite. One pit exposed a coarse–grained dolomite dike. In the carbonatite, very pronounced bands of nearly pure actinolite, apatite, magnetite, biotite–phlogopite, or pyrrhotite alternate with pink to pink–white carbonate. The rocks are highly variable in colour, texture, and grain size, but generally speaking are equigranular and medium grained. One outcrop of granitic rock in the northeast corner of the complex is strongly fenitized and extensively cut by carbonatite dikes. Table 1 lists the lithologic units for the Schryburt Lake Carbonatite Complex.

EARLY PRECAMBRIAN

Gneissic Granitic Rocks

Outcrops of country rock are rare near the complex. Two outcrops of granitic rock (unit 1a) were located on Schryburt Lake. The outcrops are banded on a scale of 1 to 5 cm, weather grey, and are grey–pink on fresh surfaces.

In thin section the rock is medium grained, massive, equigranular, allotriomorphic with curved to straight grain boundaries. The mode is estimated to be 10% microcline, 5% sericite, 30% quartz, 15% biotite and 40% plagioclase (An29–30). Traces of epidote and myrmekite are also present.

The microcline occurs as clear, anhedral, quadrille–twinned interstitial grains. The plagioclase is anhedral, interlocks with microcline and quartz, and shows incipient saussurite alteration along grain boundaries.

Biotite forms tabular, brown grains which define a weak schistosity within the rock.

TABLE 1. TABLE OF LITHOLOGIC UNITS FOR THE SCHRYBURT LAKE CARBONATITE COMPLEX.

CENOZOIC
Recent and Pleistocene
Stream, swamp, glacial deposits .

Unconformity

LATE PRECAMBRIAN
Schryburt Lake Carbonatite Complex
Sovite, silicocarbonatite, rauhaugite.
Fenitized granitic rocks.

Intrusive Contact

EARLY PRECAMBRIAN
Gneissic granitic rocks.

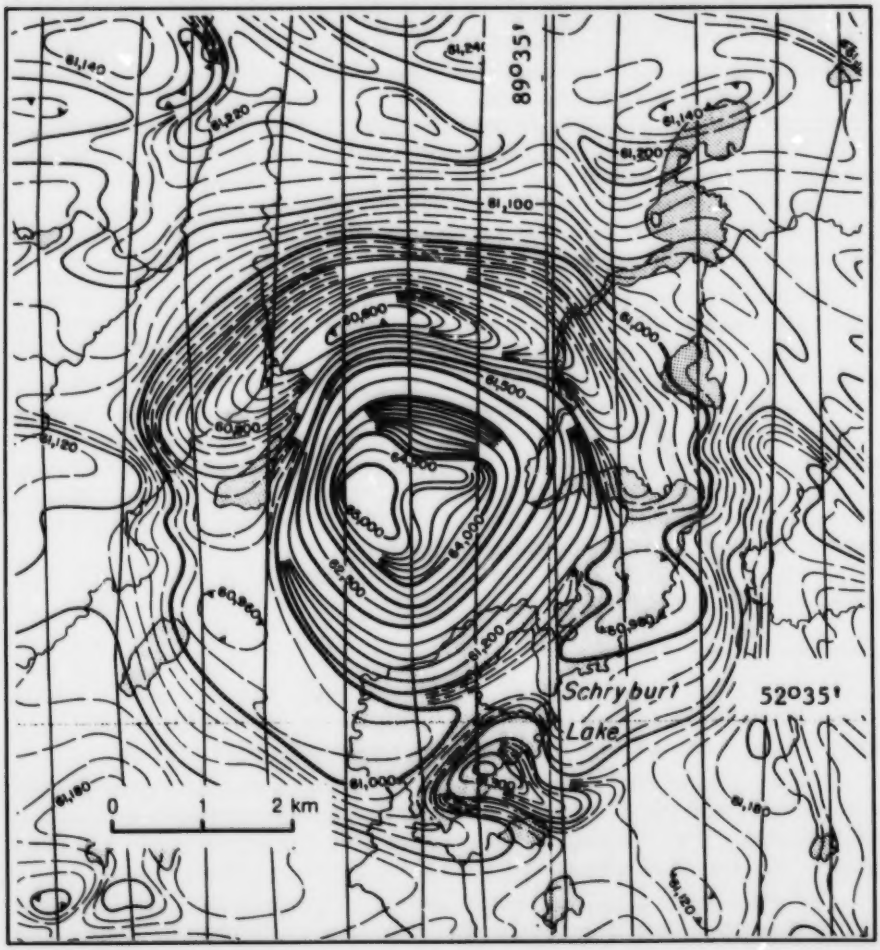


Figure 2. *Aeromagnetic map of the Schryburt Lake Carbonatite Complex (from Aeromagnetic Map 938G, ODM-GSC 1960).*

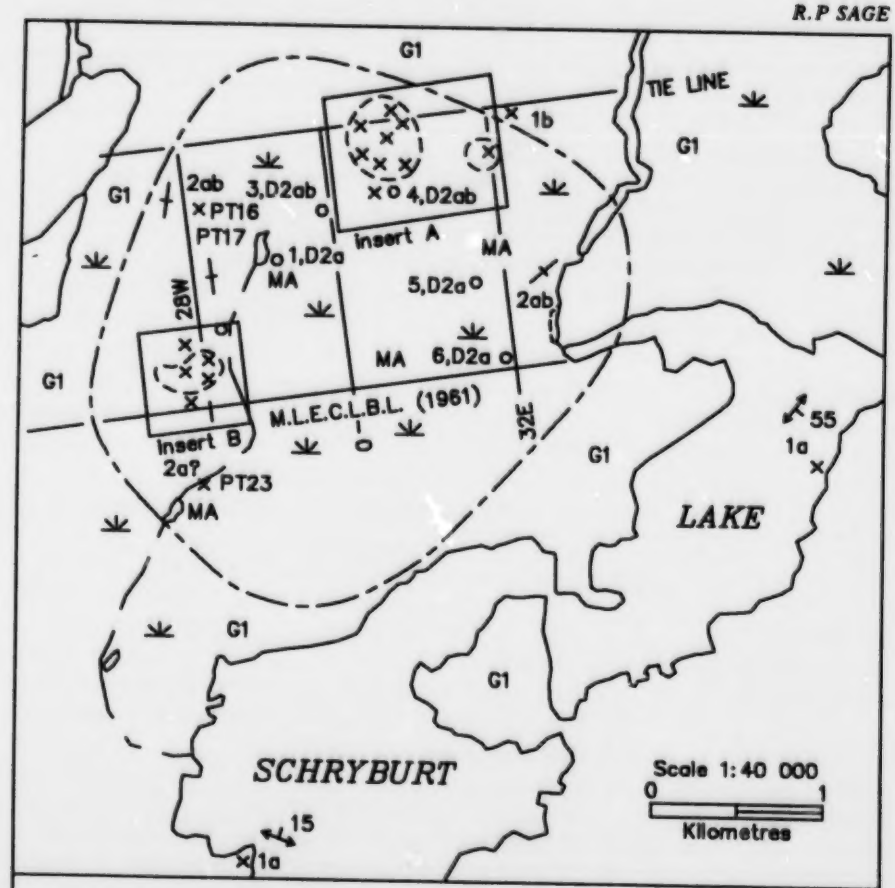
Quartz is anhedral, interstitial and occasionally contains very small needle–like amphibole crystals. These tiny, needle–like crystals may indicate an incipient fenitization. The composition of the rock is granodiorite. Mapping by Thurston *et al.* (1971) indicated generally similar granitic rocks throughout the area.

LATE PRECAMBRIAN

SCHRYBURT LAKE CARBONATITE COMPLEX

Rocks of Late Precambrian age are restricted to the Schryburt Lake Carbonatite Complex and its fenitic halo. The main lithologic units within the complex are silicocarbonatite and sovite. Ferruginous dolomite (beforsite) is a minor phase which intrudes the silicocarbonatite and sovite as a dike(s).

The silicocarbonatite and sovite display both gradational and relatively sharp contacts. On the basis of field observations the rocks classified as silicocarbonatite



LATE PRECAMBRIAN
Schryburt Lake Carbonatite Complex

2a	Sovite
2b	Silicocarbonatite
2c	Beforsite (dolomite dike rock)
1b	Fenitized and brecciated granitic rocks

EARLY PRECAMBRIAN

1a	Gneissic granitic rocks
G	Lithology interpreted from geophysics
D	Lithology from drilling

	Geological contact, inferred from geophysics
o	Diamond drillhole, with number
Nb	Niobium
U	Uranium
MA	Magnetic attraction
	Swamp
MLECLBL	Baseline (Many Lakes Explor. Co. Ltd.)

Figure 3. *Geology of the Schryburt Lake Carbonatite Complex. Geology by R.P. Sage, with additional information from assessment files.*

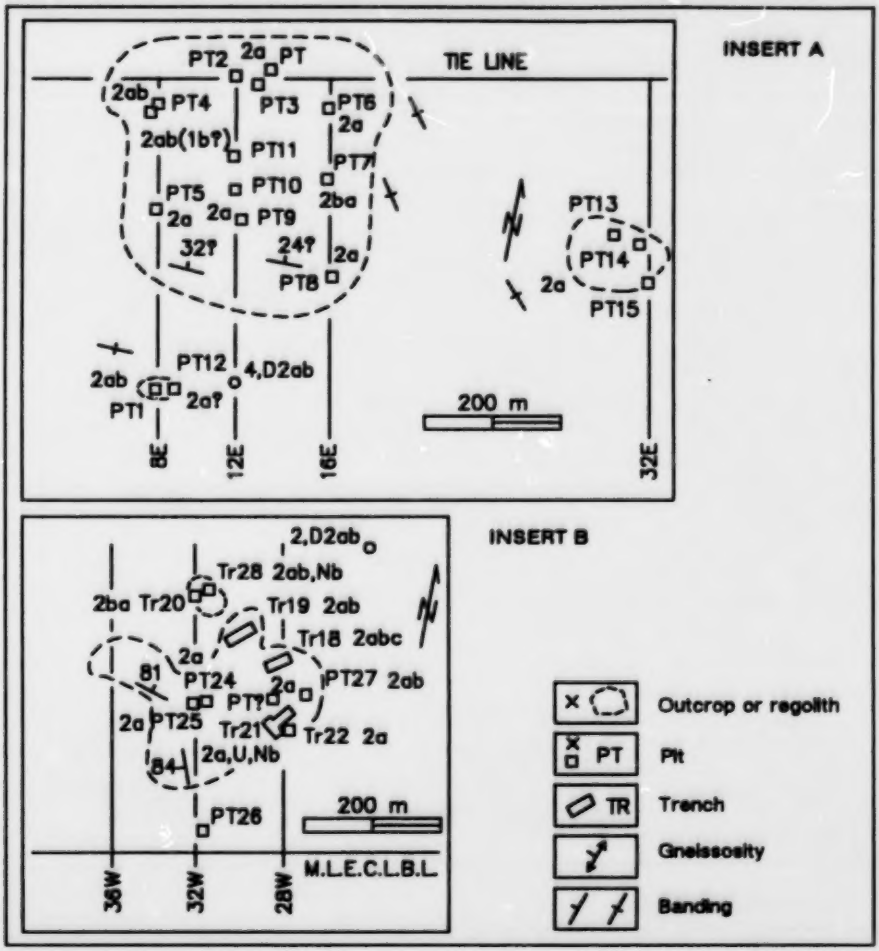


Figure 3. *continued.*

may represent three modes of formation: (1) cumulate bands within the carbonatite, (2) altered screens and xenolithic blocks of granitic gneiss, and (3) mafic dikes. The lack of exposure prevents a rigorous classification of each possible variety of silicocarbonatite.

Fenitized and Brecciated Granitic Rocks

Outcrops of altered wall rock (unit 1b) occur only on the north flank of the complex. The exposures consist of low rounded knolls which are composed dominantly of frost–heaved angular fragments and blocks.

These blocks are extensively veined with white carbonate and dark green acicular amphibole and pyroxene. The rocks have been extensively altered and quartz could not be visually identified on the outcrop. The author believes that the absence of quartz is the result of desilication caused by the process of fenitization. Two samples of these altered rocks were examined in thin section.

One thin section is a syenite which is medium grained, equigranular, massive, allotriomorphic, with curved to serrate grain boundaries. The sample is estimated to consist of 25% plagioclase (An6–10), 25% microcline, 25% perthite and 25% carbonate.

The plagioclase forms anhedral to subhedral crystals interlocked with microcline and perthite. It commonly rims perthite grains. The microcline displays well developed quadrille twinning and interlocks with both plagioclase and perthite. The perthite is a string or braided perthite. It is anhedral, interlocks with microcline and plagioclase and may be rimmed with sodic plagioclase. The carbonate is anhedral and interstitial.

The rock is an alkalic syenite and likely formed by extreme sodic and carbonate metasomatism and desilication of a former granitic rock.

The other thin section is from a carbonate–amphibole–pyroxene vein in brecciated alkalic syenite rock. Amphibole, sphene, pyroxene, apatite, and carbonate are the dominant mineral phases. Traces of feldspar are present.

The apatite is present as anhedral, rounded to subrounded grains, often elongate in outline. Grains occur in clusters or form aggregates.

The pyroxene is a clinopyroxene with ragged, anhedral cores thickly mantled by turbid amphibole. Sphene may occur poikilitically within the pyroxene. The pyroxene is a dark green, pleochroic aegirine–augite.

The amphibole forms turbid rims on aegirine–augite. The extreme outer edges of some grains tend to be clear and the grains themselves are subhedral to euhedral and pleochroic in pale green. The amphibole is likely a sodium–iron–rich variety that is typical of fenitic alteration haloes.

Sphene occurs as euhedral, wedge–shaped grains isolated in the carbonate and as inclusions within the pyroxene. The carbonate forms an interlocking mosaic of anhedral grains. The presence of sodic–iron pyroxenes and amphiboles indicates that sodium–iron–rich fluids accompanied the carbonate that fills the fractures within the altered granitic rock.

Silicocarbonatite

Silicocarbonatite (unit 2b) occurs as resistant clots in weathered, disaggregated carbonatite and as bands alternating with sovite. The rocks are fine to medium grained, generally massive, and commonly rich in biotite–phlogopite. The rocks weather black, grey–black, grey–brown and brown. The brown varieties tend to be richer in biotite–phlogopite, the grey–black and grey–brown varieties richer in carbonate, and the black varieties richer in magnetite, olivine and perovskite.

In thin section the rocks are fine to medium grained, massive, equigranular to inequigranular–seriate, hypidiomorphic to allotriomorphic, with curved to straight grain boundaries. The mode is estimated to be 0–20% amphibole, 5–45% magnetite, 5–70% biotite–phlogopite, 0–40% chondrodite, 10–50% carbonate, 0–50% olivine, 0–15% apatite, 0–40% perovskite, and 0–20% clinopyroxene. Minor sericite and pyrochlore are present in one or more thin sections.

The amphibole occurs as acicular, euhedral crystals that are pleochroic from very pale green to nearly colourless. The crystals interlock with the biotite–phlogopite and may completely penetrate some chondrodite grains. The amphibole may be the sodic amphibole, richterite. The magnetite occurs in anhedral to euhedral crystals. The grains are disseminated throughout the thin sections and in places are poikilitically enclosed in biotite–phlogopite. Some of the larger magnetite grains are actually composites of several smaller grains.

Biotite–phlogopite occurs as anhedral to euhedral grains and is the dominant phase in some samples. Some samples may contain only phlogopite and others only biotite. The mica is commonly zoned, and consists of pleochroic, pale brown to yellow–brown cores (phlogopite) and dark brown to dark red–brown rims (biotite). On occasion the biotitic rims are ragged or cuspate, perhaps due to reaction with the carbonatite magmas. A much rarer form of zoning that was noted in several thin sections consists of a pleochroic brown core and very pale brown to yellow brown rim. In one instance the turbid appearance of the cores appears to be caused by very fine–grained, platey, opaque inclusions. These inclusions occur in three sets at approximately 60° to each other. Uncommonly, the (001) cleavage planes are weakly bent in some of the larger biotite–phlogopite grains. In places, the biotite–phlogopite poikilitically contains magnetite.

Chondrodite is anhedral in form and displays a pale yellow to bright yellow pleochroism. In some thin sections it forms a major phase and in others it occurs as isolated patches along the margins of fresh olivine grains. It is likely that most of the chondrodite is the result of olivine alteration caused by the interaction of olivine and late magmatic liquids within the carbonatite magmas. Some amphibole crystals completely penetrate grains of chrondrodite. The chondrodite locally encloses irregular, anhedral, carbonate grains or magnetite and is associated with ragged biotite. The chondrodite appears similar to the clinohumite observed by the author at the Cargill Township Carbonatite Complex.

The carbonate is clear and colourless and occurs interstitially to the other minerals. It forms an interlocking mosaic of anhedral grains.

The olivine is often fresh and occurs as anhedral to subhedral grains. Minor alteration to chondrodite may be present along grain margins and fractures traversing the grains. Some fine–grained magnetite may or may not be present in proximity to the chondrodite alteration. Magnetite is rarely poikilitically enclosed in the olivine and one grain of olivine poikilitically contains amphibole.

In one thin section consisting of 50% fresh olivine the olivine occurs in a possible eutectic intergrowth of olivine and carbonate (Photo 1). In skeletal grains of olivine, thin ribs of fresh olivine alternate with carbonate. Magnetite is the only other dominant mineral phase present and it also occurs in skeletal form (Photo 2). The author has also observed such intergrowths in the Firesand River and Valentine Township Carbonatite Complexes.

Apatite occurs as anhedral to subhedral grains, which are commonly round to round–elongate in outline.

Perovskite is present in several thin sections. It is weakly translucent to opaque and occurs as euhedral crystals. The grains have opaque cores and weakly anisotopic rims and are likely compositionally zoned. They are closely associated with magnetite.

Clinopyroxene is present in several thin sections. The crystals are subhedral to euhedral, colourless, and optically have the composition of diopsidic augite. One grain encloses biotite and rounded inclusions of carbonate. Higgins (1977, p.20) observed a faint zoning in some crystals and the author has previously noted zoning of the pyroxene in one thin section (Thurston *et al.* 1979, p.241).

Pyrochlore is present in only one thin section, which was made from a magnetite–rich sample from trench 21 of Many Lakes Exploration Company Limited (*see* Figure 4). Radioactivity was 8 to 9 times background within the bottom of the trench and the soil consisted of magnetite and carbonate grains derived from disaggregated medium–grained carbonatite.

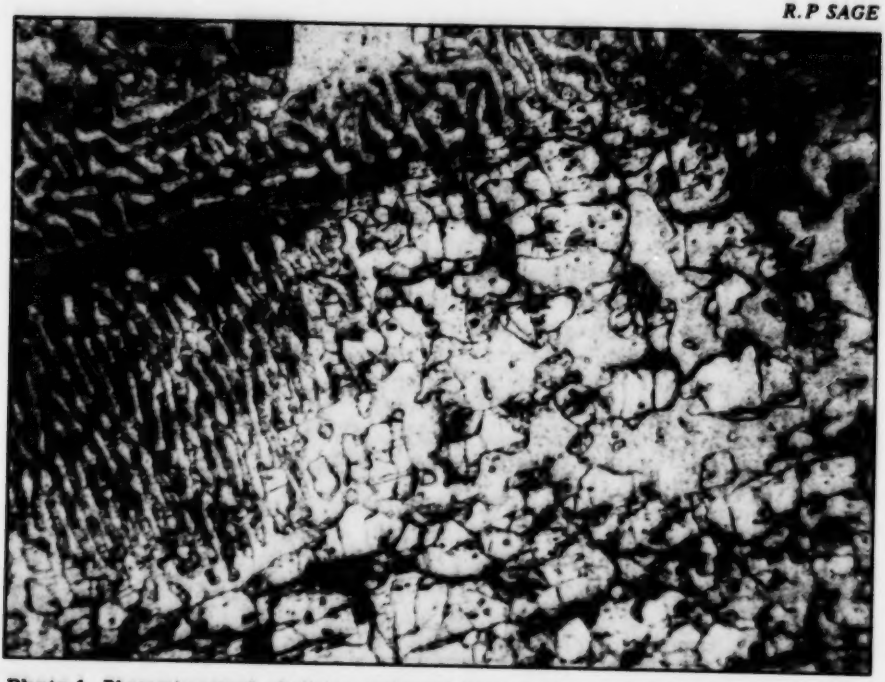


Photo 1. *Photomicrograph of olivine-carbonate intergrowths, uncrossed nicols. Magnification approximately 10X. Photograph by D. Watkinson, Carleton University.*

Photo 2. *Photomicrograph of skeletal magnetite in association with olivine-carbonate intergrowths; uncrossed nicols. Magnification approximately 3.5X. Photograph by D. Watkinson, Carleton University.*

A coherent sample was collected from a pit within the trench at a depth of approximately 1.5 m. In thin section pyrochlore is present as dark brown, subhedral grains. It occurs as isolated grains within carbonate and as grains perched on the edge of magnetite grains. One of the larger grains contains inclusions or blebs of carbonate. Cracks radiate out from this grain.

A large sample of weathered rock was screened for the −100+140 mesh fraction and then superpanned. The radioactivity was found to be in the heavy mineral fraction. This fraction was passed through a Franz separator and both magnetic and non-magnetic separations were examined spectrographically. Both separations are high in Zr, Nb and U. The non-magnetic sample was examined in detail. Baddeleyite (ZrO_2), one of the first minerals found, accounts for the high zirconium content. Several well formed octahedra, which failed to give an X-ray diffraction pattern, are present in this fraction. One grain was heated and subsequently gave a diffraction pattern of pyrochlore. The uranium is thus likely held in the mineral pyrochlore which has subsequently become metamict due to its presence. Uranium-bearing pyrochlore likely accounts for the high uranium and niobium values of the samples.

A sample of the soil, assayed for uranium and niobium, returned 0.039% U_3O_8 and 0.08% niobium. Considering the relatively low uranium and niobium values in the bulk sample of the weathered carbonatite, which can be considered closely analogous to the fresh rock, the uranium content within the widely disseminated and scarce pyrochlore grains is relatively high. All analytical and X-ray work was completed by W. Hicks, Geoscience Laboratories, Ontario Geological Survey.

All trenches were checked with a geiger counter. Niobium assays are reported by Many Lakes Exploration Company Limited from many of these pits (Parsons 1961), however radioactivity was absent or not detected with the instrument used by the author. It is therefore concluded that all pyrochlore is not likely to be uranium-bearing.

The banding in the perovskite-rich sample is thought by the author to be suggestive of a cumulative origin. The olivine-amphibole-pyroxene-rich samples are perhaps mafic dikes. The biotite-rich silicocarbonatites may be altered gneissic (?) inclusions.

The difficulty in determining the genesis of these carbonate-rich mafic-rich rocks is emphasized to make the reader aware that the chemical analyses of the silicocarbonatites, reported in Appendix A, likely represent rocks of diverse origin.

Sovite

Sovite (unit 2a) contains 50% or more carbonate and has been observed to display both gradational and sharp contacts with silicocarbonatite. As with silicocarbonatite this lithologic unit does not occur in outcrop except at the rapids of Schryburt Creek. Most of the rock at the creek consists of frost-heaved slabs and is thus not bedrock. The remaining samples were resistant lumps in the regolith soil exposed in trenching by Many Lakes Exploration Limited.

The sovitic rocks generally have a caliche deposit on their surface and along internal fractures of those samples obtained from the trenches. This caliche deposit imparts a buff to white surface to the rock. On fresh surface the rocks are grey, grey-white, pink, white and buff. The higher the carbonate content, the lighter the colour. The texture of this rock suite is fine to medium grained, mas-

sive, equigranular to inequigranular–seriate, hypidiomorphic. Several samples are allotriomorphic with curved to straight grain boundaries. The mode is estimated to be 0–15% biotite–phlogopite, 0–20% apatite, 0–10% amphibole, 50–100% carbonate and 0–10% magnetite.

Perovskite, pyrochlore, sphene, pyrrhotite and chlorite occur in minor to trace amounts. Two thin sections contain 5 and 10% chondrodite respectively; one contains an estimated 20% olivine; and one contains 10% pyrrhotite. Olivine and chondrodite are the same as described under "Silicocarbonatite" above. The minor chlorite noted in one thin section was after olivine and traces of serpentine may also be associated with it. The chlorite occurs as radiating sheaves along the edges of several grains and along internal fractures within the olivine grains. It is pleochroic in blue to bluish–green.

Chondrodite was visually identified in only one band within the sovitic outcrop in the bottom of Schryburt Creek at the rapids. This band is discontinuous and the chondrodite may compose an estimated 10% of the band. The chondrodite grains are yellow–orange in colour, subhedral in form, and less than 1 mm in diameter. It is possible that this chondrodite is a primary mineral and not the result of olivine alteration.

Pyrrhotite occurs as anhedral aggregates of roughly tabular, pale, brassy grains that define discontinuous sulphide–rich streaks in the banded carbonatites. Pyrrhotite, as do the other accessory minerals, occurs as distinct bands within the carbonatite. Higgins (1977, p.25) reported trace amounts of pentlandite and chalcopyrite in association with the pyrrhotite.

One thin section contains nearly 20% very fine–grained, brown, turbid alteration, possibly composed dominantly of biotite(?).

Biotite–phlogopite occurs as anhedral to euhedral crystals with tabular to ragged outlines. Rare grains with a sieve–like texture were noted which poikilitically contain carbonate, apatite and magnetite. Random inclusions of one or more of the above minerals is generally common. Biotite–phlogopite is commonly zoned from pleochroic, pale brown to yellow–brown cores (phlogopite) to brown, dark brown, red–brown rims (biotite). Several of the red–brown rims have cuspate grain margins suggesting reaction with the carbonatite magma.

Apatite grains are anhedral to subhedral and round to round–elongate. The apatite is concentrated in bands within the sovitic rocks. The apatite occurs as vitreous green crystals up to 5 mm in length and their long axes lie in the plane of the foliation or mineralogic banding.

Amphibole forms acicular, euhedral, pleochroic, pale green crystals. The amphibole is likely a sodic variety. In one thin section the amphibole occurs as very small fibres which have an orientation resembling a herringbone pattern. Some amphibole crystals penetrate chondrodite grains. The pale green pleochroism is readily apparent only in the thicker crystals. The amphibole needles are often visible in hand samples as green to pale green, needle–like grains up to 1 cm in length. The amphibole is concentrated into bands within the sovitic rocks and the long axes of the grains lie in the plane of foliation or mineralogical banding.

Ubiquitous magnetite occurs as anhedral to euhedral crystals and granular aggregates. Variation in black magnetite content in white to pink–white carbonatite imparts a mineral and colour banding to the sovitic rocks. Euhedral magnetite crystals approaching 1.5 cm have been observed but most are much less than 0.5 cm.

The author (Thurston *et al.* 1979) and Higgins (1977, p.27) have previously identified zircon in thin section and Higgins (1977, p.27) reported fluorite. The author (Thurston *et al.* 1979) previously reported the possible presence of trace amounts of nepheline in one thin section.

Beforsite

Beforsite (unit 2c) is relatively rare at the Schryburt Lake Carbonatite Complex, and was observed only in Many Lakes Exploration Company Limited trench number 18. It is a coarse– to very coarse–grained, nearly pure, carbonate rock which, from its spatial distribution, is likely a dike cutting silicocarbonatite and sovite. On the basis of its coarse–grained nature the rock could be classified as a carbonatite pegmatite. On weathered surfaces, a thin yellow–brown to light brown coating of iron oxide has formed, suggesting that the carbonate is ferruginous. The fact that this coarse–grained rock is dolomite has been confirmed by X–ray diffraction (Geoscience Laboratories, Ontario Geological Survey).

In thin section this rock is coarse grained, equigranular, massive, allotriomorphic, with curved to straight grain boundaries.

Higgins (1977, p.14,16) stained several thin sections of sovite rock for dolomite and detected its presence in minor quantities in several sections. The dolomite occurs as isolated grains intergrown with calcite, and as bands within calcite (Higgins 1977, p.14,16).

PETROLOGY

Samples of this complex were collected from test pits and from frost–heaved slabs along a creek bed on the east side of the complex. The freshest material was submitted for complete chemical analysis (Tables A–2, A–3, Appendix A). However, the very limited area of the complex sampled would imply that the chemical data may not reflect the general composition of the complex as a whole. The silicocarbonatite suite may represent cumulate phases, altered xenoliths, or dike rocks and thus their compositions may not be related directly to initial magma compositions. Liquid immiscibility may play a dominant role in carbonatite genesis (Nash 1972; Hamilton *et al.* 1979; LeBas and Handley 1979; Freestone and Hamilton 1980). As a consequence of liquid immiscibility, continuous evolutionary chemical trends in melt compositions are not likely. The process of fenitization will remove alkalies from a carbonatite magma, thus the carbonatite must be considered a residuum. Therefore, the chemical data in Appendix A cannot be used for postulating liquid trends.

The norms (Table A–4) for samples from this intrusion were calculated by the methods outlined by LeBas (1973) and the average compositions of each lithology (Table A–5) were calculated using the procedure of Nie *et al.* (1975).

METAMORPHISM

The rocks of the Schryburt Lake complex lack petrographic evidence of metamorphism. The two outcrops of altered granitic rock in the northeast corner of the complex are interpreted to have undergone sodium–iron–carbonate metasomatism. Silica was depleted from these rocks concomitant with metasomatism. This metasomatic–thermal event gave rise to the syenitic rock veined with carbonate and sodic–iron pyroxenes and amphiboles.

The granitic gneisses that may enclose the complex have not been studied in sufficient detail to make a definitive statement as to their metamorphic rank (Thurston *et al.* 1979).

STRUCTURAL GEOLOGY

The lack of outcrop within and surrounding the Schryburt Lake Carbonatite Complex prevents a rigorous study of local or regional geologic structures. Regional aeromagnetic maps (ODM–GSC 1970) display a strong linear northwest–trending isomagnetic pattern. The Schryburt Lake Carbonatite Complex may have been emplaced into a regional northwest–trending fault zone.

INTERNAL STRUCTURES

Relict banding in the residual soils exposed in the trenches are highly variable in their orientation and care must be exercised in measuring the attitude of the banding since soil creep has likely affected some of the exposures. Banding varies from less than 5 mm to over 10 cm in width due to widely varying mineral contents. Mineral variation, dominantly of biotite–phlogopite and magnetite, also imparts a colour banding to the rock. Mafic clots, xenoliths, and ribs weather in relief and accentuate the banding. Some of the inclusions are oriented parallel to banding and conceivably could be a boudinaged dike rock or an inclusion trail whose fragment distribution was determined during emplacement of the carbonatitic magmas. The best place to observe banding in the carbonatite is at the rapids on Schryburt Creek.

RECOMMENDATIONS FOR FUTURE STUDY

Detailed optical and microprobe studies of the mineral phases are recommended and could be carried out on the present sample suite. Other studies will be dependent on new samples which may be collected during future exploration activities. The present suite of samples are from a very limited area of the intrusion and additional work on the body is likely to disclose additional rock types or variants of the presently known lithologies. A Rb–Sr or U–Pb isotopic age is desirable to confirm the K–Ar age.

Economic Geology

Work by Many Lakes Exploration Company Limited in 1961 disclosed widespread but erratic niobium values. Work by the author has confirmed the presence of uranium, possibly in a uranium–bearing pyrochlore. In 1977, the International Minerals and Chemical Corporation completed six reverse circulation drill holes. Residual apatite accumulations were encountered within one of these drill holes.

PROPERTY DESCRIPTIONS

MANY LAKES EXPLORATION COMPANY LIMITED [1961]

There originally was no record of any work on the complex filed with the Assessment Files Research Office, Ontario Geological Survey. The Many Lakes Exploration Company Limited, a wholly–owned subsidiary of E.I. DuPont De Nemours Company Limited, has donated to the Ministry records of work completed on the body up to 1961.

G.E. Parsons, while employed by Many Lakes Exploration Company Limited, staked 34 claims covering most of the aeromagnetically inferred carbonatite complex for the company in late 1960. Line cutting, geological mapping and a ground magnetic survey were completed over the claim group in 1961. Twenty–two pits and 6 trenches were dug into areas of carbonatite soils and samples taken for assay. The carbonatite was described by Parsons (1961a, p.6) as follows:

"The carbonatite consists of varying proportions of calcite, magnetite, perovskite, fluorite*, pyrochlore and sulphides. It varies from nearly pure calcite to almost pure apatite. Bands of nearly massive magnetite several feet across are also present, and in some cases carrying up to 10% perovskite. Green, streaky fragments and bands consisting mostly of apatite and mica are common features in the carbonatite.

"Except for the outcrop and boulder area, in the river running out of Schryburt Lake on the east boundary of the property, all carbonatite found is a granular type, in the river, it occurs as slabs and as a solid outcrop in its floor. Where the granular carbonatite is near surface, it is covered with residual soils, generally brown, micaceous and radioactive."

Significant pyrochlore mineralization was reported from only trench number 28, where it is associated with high radioactivity, with apatite–rich material, and is in close proximity to a nearly massive, magnetic band (Parsons 1961a, p.1). Pyrochlore from this trench is reported to occur as olive–green crystals and samples from this trench assayed 1.82% niobium oxide (Parsons 1961a, p.6).

Many Lakes Exploration Company Limited took 55 samples, of which 43 assayed below 0.1% niobium oxide, 8 between 0.1 and 0.3%, and 4 between 0.3 and 1.82% (Parsons 1961b, p.2) (Figure 4, Table 2). Parsons (1961b, p.2) reported that the lower niobium values occur mainly in perovskite, and the higher values occur in pyrochlore associated with apatite–rich samples. Parsons (1961a, p.2) also reported that there is no obvious direct correlation between niobium values and magnetite or between radioactivity and pyrochlore content.

Fine–grained vermiculite occurs locally in concentrations up to 50% (Parsons 1961b, p.2). Parsons (1961b, p.13) recommended test pitting in the vicinity of ground magnetic anomaly "A" between lines 8W and 12W on the Many Lakes Exploration Company Limited grid. It was anticipated that bedrock may be close to surface in this area (Parsons 1961a, p.13). This pitting was never completed.

*Note: the author did not confirm the presence of fluorite.

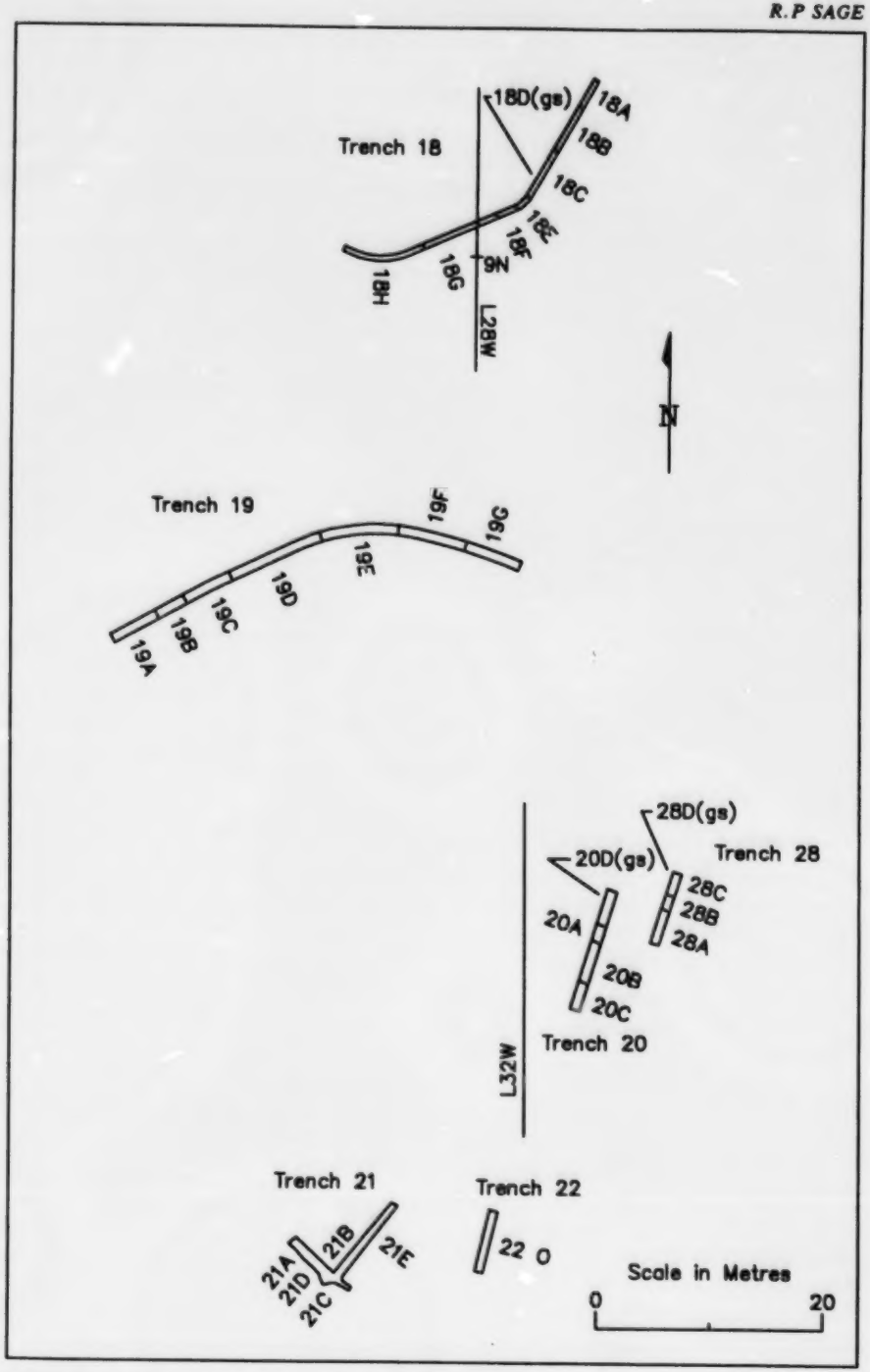


Figure 4. *Sketch map of Many Lakes Exploration Company Limited's trenches showing samples taken for niobium assays. For assays see Table 2. Sketch and assays from Parsons (1961).*

TABLE 2. NIOBIUM ASSAYS (Nb_2O_5) OF SAMPLES COLLECTED FROM TRENCHES AND PITS. FROM PARSONS (1961).

Pit/Trench	% Nb_2O_5	Location
1	0.069	L8E, 37+00N, 0+00E
2	0.054	T.L.52N, 11+75E, 0+10N
3	0.14	T.L.52N, 13+00E, 0+355
4	0.081	L8E, 51+05N, 2-10W
5	0.024	L8E, 45+85N, 0+1.5W
6	0.035	L16E, 50+80N, 0+00W
7	No Sample	L16E, 47+25N, 0+00W
8	0.021	L16E, 42+80N, 0+25E
9	0.010	L12E, 45+15N, 0+25E
10	0.052	L12E, 46+80N, 0+00E
11		L12E, 48+10N, 0+00E
12		L8E, 37+00N, 0+75E
13	0.05	L32E, 44+00N, 1+20W
14		L32E, 44+00N, 0+35W
15	0.025	L32E, 44+00N
16	0.048	L28E, 38+66N, 0+20E
17	0.086	L28E, 38+70N, 0+95E
18A	0.057/10ft (i)	Trench #18
18B	0.086/16ft	
18C	0.11/14ft	
18D	0.15/GS	
18E	0.043/6ft	
18F	0.057/16ft	
18G	0.072/23ft	
18H	0.072/24ft	
19A	0.057/16ft	Trench #19
19B	ND/19ft	
19C	0.072/13ft	
19D	0.10/28ft	
19E	0.014/22ft	
19F	0.086/18ft	
19G	0.043/11ft	
20A	0.086/5ft	Trench #20
20B	0.19/12ft	
20C	0.043/6ft	
20D	0.31/GS	
21A	0.057/11ft	Trench #21
21B	0.072/5ft	
21C	0.072/6ft	
21D	0.33/1ft	
21E	0.26/24.5ft	
22	0.057/7ft	Trench #22
23	No Sample	L32E, 13+80S, 1+70E
24	0.043	L32W, 7+00N, 0+43E
25	0.086	L32W, 7+00N, 0+00E
26	0.11	L32W, 1+20W, 0+26E
27	0.072	L28W, 7+55N, 1+29E
28A	0.21/12ft	Trench #28
28B	0.30/5ft	
28C	0.40/8ft	
28D	1.82/GS	

Note:
(i) = Many Lakes Explor. Co. Ltd. samples
GS = Grab Samples
ND = Not detected.

Parsons (1961a, p.11) noted that ground magnetics displayed a crude ring-like banding and that the magnetic highs are over areas rich in disseminated magnetite.

INTERNATIONAL MINERALS AND CHEMICAL CORPORATION [1977]

In 1975, the International Minerals and Chemical Corporation staked 155 claims covering the aeromagnetic anomaly over the Schryburt Lake Carbonatite Complex (Erdosh 1977). In 1976 the complex was examined by geologic mapping and soil survey and the claim group was reduced to 82 (Erdosh 1977).

In 1977 the company completed 6 vertical reverse circulation drill holes totalling 288 m. The overburden is relatively shallow varying from 2.4 m to 13.5 m and averaging 8.25 m (Erdosh 1977). This drilling encountered residual apatite accumulations only in hole SC-1. Within this hole 9.0 m of apatite-rich residual soil returned an average assay of 17.5% P_2O_5 (Erdosh 1977, p.7). The areal extent of this residual apatite accumulation is unknown. Table 3 lists phosphate assays completed by the company. Some of the samples were checked for radioactivity (Erdosh 1977). This spot checking indicated radioactivity to be present, but not of sufficient intensity to warrant additional work (Erdosh 1977).

TABLE 3. PHOSPHATE ANALYSES OF SELECTED SAMPLES FROM REVERSE CIRCULATION DRILLHOLES ON THE SCHRYBURT LAKE CARBONATITE COMPLEX. FROM ERDOSH (1977).

Hole No.	Interval (feet)	Weight% P_2O_5
SC-1	45-50	19.6
	50-55	18.9
	75-80	14.0
	100-105	7.00
	120-125	8.60
	140-145	5.70
	155-160	8.90
	165-170	3.68
SC-2	35-40	2.90
	115-120	1.80
SC-3	10-15	1.70
	25-30	1.65
	50-55	0.70
	75-80	1.65
	105-110	2.85
	130-135	1.15
SC-4	50-55	1.30
	140-145	1.50
SC-5	50-55	2.25
	80-85	2.40
	110-115	4.70
SC-6	45-50	2.30
	145-150	2.65

Analyses by R.E. Buehrle.

The company completed mineralogical studies on acid–insoluble mineral residues and in addition to the minerals found by the author the company reported the presence of quartz, ilmenite, goethite, pyrite, feldspar and zircon.

RECOMMENDATIONS FOR THE PROSPECTOR

Approximately 3% of the complex has been examined, disclosing erratic values in niobium and, in one of the old test pits, anomalously high radioactivity. The complex requires much additional testing for its niobium potential and may warrant close examination for uranium mineralization. The complex requires additional testing for apatite, which occurs as residual soil infillings on the bedrock surface of the complex. Vermiculite concentrations may occur either alone, or in conjunction with apatite or other mineral commodities. The apatite should be checked for rare earth element content. The complex must be considered to be wide open for additional exploration work.

Appendix A — Petrographic Descriptions, Chemical Analyses, Normative Compositions, and Statistical Compositions of Lithologic Units of the Schryburt Lake Carbonatite Complex.

TABLE A-1. PETROGRAPHIC AND FIELD DESCRIPTIONS OF WHOLE-ROCK SAMPLES FROM THE SCHRYBURT LAKE CARBONATITE COMPLEX.

Reference No. 1108
Sample No. HEF13-1A

Amphibole, biotite, apatite sovite.

Field Description. Fine to medium grained, equigranular, buff to pale pink. Traces of pyrrhotite are present. The sample is banded due to relative variation in accessory mineral content. The sample was taken from a large slab in bed of Schryburt Creek. Map unit 2a.

Petrographic Description. Fine to medium grained, massive, equigranular, hypidiomorphic. Apatite forms anhedral rounded to rounded-elongate grains. Biotite forms anhedral to euhedral crystals with pleochroic brown cores and dark reddish brown rims. Amphibole forms euhedral, acicular crystals, pleochroic in pale green. Minor anhedral to subhedral, disseminated magnetite is present.

Reference No. 1109
Sample No. HEF13-3

Apatite, pyroxene, magnetite, phlogopite silicocarbonatite.

Field Description. Fine grained, massive, equigranular. Weathered surfaces are brownish black, fresh surfaces black. Mica is abundant. The sample was taken from a resistant lump in carbonatite soil. Map unit 2b.

Petrographic Description. Fine to medium grained, massive, equigranular, hypidiomorphic. Magnetite forms anhedral to euhedral, disseminated grains and may be poikilitically enclosed in phlogopite. Olivine forms anhedral to subhedral crystals with traces of incipient alteration to chondrodite. Phlogopite forms tabular, anhedral to subhedral crystals, pleochroic in pale brown to pale yellowish brown. The pyroxene is a colourless clinopyroxene (diopsidic augite) forming subhedral to euhedral crystals. Apatite forms anhedral to euhedral, disseminated crystals and may partially enclose phlogopite. Apatite forms clotty aggregates of crystals. Carbonate forms an interlocking mosaic of anhedral crystals.

Reference No. 1110
Sample No. HEF13-6A1

Phlogopite, magnetite, olivine sovite.

Field Description. Fine to medium grained, equigranular, with minor, disseminated magnetite and scattered grains of pyrrhotite. Slight variations in accessory mineral content gives grey colour and mottled appearance. The sample was taken from resistant clot in carbonatite soil. Map unit 2a.

Petrographic Description. Fine to medium grained, equigranular, allotriomorphic, with curved to straight grain boundaries. Olivine is anhedral, forms rounded grains, altering to and being replaced by serpentine and chlorite. Traces of chondrodite occur along margins. Amphibole occurs as radiating, acicular needles normal to and marginal to some olivine grains. Apatite forms rounded to rounded-elongate, anhedral grains. Magnetite is anhedral and disseminated. Phlogopite forms small, tabular crystals pleochroic in pale brown to reddish brown. Carbonate forms an interlocking mosaic of anhedral grains.

Reference No. 1111
Sample No. HEF13-7

Amphibole, olivine, biotite-phlogopite silicocarbonatite.

Field Description. Fine grained, massive, brownish black to black, equigranular. Sample is a resistant clot in carbonatite soil. Sample appears to contain a relatively high mica content. Map unit 2b.

Petrographic Description. Fine to medium grained, massive, equigranular, allotriomorphic, with straight to curved grain boundaries. Carbonate is anhedral and interstitial. Magnetite is anhedral to subhedral and disseminated. Olivine forms anhedral, rounded grains with minor chondrodite alteration on rims of some grains. Amphibole is prismatic, acicular, colourless and rarely occurs as large grains, which are ragged, somewhat poikiloblastic, and enclose magnetite and chondrodite grains. Biotite forms anhedral, brown grains; larger grains have dark grey, turbid cores rimmed with pale brown to yellow-brown phlogopite. Some bending of (001) cleavage was noted. Smaller phlogopite grains in matrix are pleochroic in brown to yellow brown.

Reference No. 1112
Sample No. HEF13-9

Beforsite.

Field Description. Coarse grained, light yellowish brown carbonate with thin limonitic coating; it forms resistant band in weathered carbonatite soil and is likely a ferruginous dolomite dike. Map unit 2c.

Petrographic Description. Medium to coarse grained, massive, equigranular, allotriomorphic, with straight to curved grain boundaries. Carbonate forms an interlocking aggregate of anhedral grains.

Reference No. 1113
Sample No. HEF13-11

Apatite sovite.

Field Description. Medium to coarse grained. Scattered euhedral crystals of phlogopite are set in white to buff carbonate. Rock is 90% carbonate. The sample was taken from resistant lump in weathered carbonatite soil. Map unit 2a.

Petrographic Description. Fine to medium grained, massive, equigranular, allotriomorphic, with straight to curved grain boundaries. Apatite forms anhedral, rounded to rounded-elongate grains. Minor subhedral magnetite is present. Minor phlogopite has narrow, pleochroic dark reddish brown rims.

Reference No. 1114
Sample No. HEF13-24

Magnetite, limonite-bearing sovite.

Field Description. Fine grained, equigranular, pink to purple. Greenish-blue chlorite and traces of biotite are present throughout rock. The rock is probably a highly altered xenolithic inclusion. Not coded.

Petrographic Description. Fine to medium grained, massive, equigranular, allotriomorphic, with straight to curved grain boundaries. Carbonate forms an interlocking mosaic of anhedral grains. Minor limonite is after biotite(?) and magnetite(?). Traces of chlorite are present.

Reference No. 1115
Sample No. SCR-8

Chondrodite-bearing, amphibole, magnetite, apatite, olivine silicocarbonatite.

Field Description. Fine grained, equigranular, massive. Thin, discontinuous capillary streaks of carbonate are distributed throughout the sample. Weathered surfaces are brown, fresh surfaces black. Rock is homogeneous. Map unit 2b.

Petrographic Description. Fine to medium grained, massive, inequigranular-seriate, hypidiomorphic. Chondrodite is minor, forming anhedral, ragged grains, in part after olivine. Amphibole occurs as very fine grained, needle-like crystals, which sometimes form radiating clusters with a branching herringbone pattern. Apatite forms anhedral to subhedral, rounded to rounded-elongate grains. Apatite is concentrated in streaks and is closely associated with olivine. Olivine forms rounded grains, with dark brownish alteration along curved cracks. Olivine is commonly altered to radiating green chlorite and serpentine with unaltered relict cores. Magnetite forms disseminated, anhedral to subhedral grains.

Reference No. 1116
Sample No. SCR-9

Sovite.

Field Description. Fine to medium grained, equigranular, massive. Weathered surfaces are grey-buff, fresh surfaces dark grey. Some magnetite and traces of pyrrhotite are evident. Sample HEF13-6A1 was taken from the same rock. The sample was taken from a resistant clot in a carbonatite soil. Map unit 2a.

Petrographic Description. Fine grained, equigranular, massive, hypidiomorphic. Amphibole forms minor acicular grains, which are euhedral, with pale green pleochroism. Chondrodite forms anhedral grains interlocking with biotite and magnetite. Biotite forms brown, anhedral to euhedral grains; larger grains have pale phlogopitic cores and dark reddish brown biotitic rims. Magnetite is anhedral and disseminated. Carbonate forms anhedral, interlocking, interstitial grains.

Reference No. 1117
Sample No. SCR-11

Magnetite, biotite silicocarbonatite.

Field Description. Fine grained, massive, equigranular. Weathered surfaces are brown, fresh surfaces black. The sample was taken from resistant lump in carbonatite soil. Mica is common. Map unit 2b.

Petrographic Description. Fine grained, equigranular, massive hypidiomorphic. Carbonate forms an interlocking mosaic of anhedral grains. Carbonate is slightly clotty. Magnetite forms anhedral to subhedral grains which are disseminated throughout. One or two grains of skeletal magnetite were noted. Biotite is fine grained, anhedral to euhedral, pleochroic in brown to reddish brown and forms an interlocking mass. Traces of amphibole are present.

Reference No. 1118
Sample No. SCR-13 (2 thin sections)

Chondrodite, amphibole, olivine, magnetite, biotite silicocarbonatite.

Field Description. Fine to medium grained, equigranular, massive. Weathered surfaces are brown, fresh surfaces black. Rare grains of magnetite are 5 to 7 mm in diameter. Two samples broken from same hand sample were examined in thin section. The sample was taken from a resistant lump in carbonatite soil. Map unit 2b.

Petrographic Description. (1) Fine grained, massive, equigranular, hypidiomorphic. Carbonate is anhedral and interstitial. Magnetite is anhedral to subhedral, and disseminated throughout. Biotite forms anhedral grains commonly with ragged outlines. Pale brown phlogopitic cores are mantled with reddish brown biotitic rims. The most intensely zoned grains have more ragged margins. Chondrodite forms anhedral grains and was noted to poikilitically enclose magnetite and amphibole, which may be in part the result of late stage reaction of olivine with carbonatitic magma. Olivine forms anhedral grains which locally have spotty chondrodite alteration along rims. Amphibole forms euhedral to subhedral crystals with very pale green pleochroism. Traces of perovskite are present.

(2) Fine grained, massive, equigranular, hypidiomorphic. Carbonate forms anhedral, irregular, interstitial grains. Biotite forms ragged grains with pale brown phlogopitic cores and reddish brown, biotitic rims. Olivine forms anhedral, rounded grains with scattered patches of clinohumite along grain margins. Olivine contains amphibole and magnetite inclusions. Chondrodite forms anhedral, spotty grains along margins of olivine and occasionally is associated with amphibole. It rarely occurs as irregular, spotty replacements of olivine. Amphibole forms needle-like, acicular crystals. Amphibole is poikilitic in olivine and chondrodite. Perovskite and magnetite occur in composite grains. Both are anhedral to euhedral in form and disseminated throughout. Trace amounts of apatite are present.

Reference No. 1119
Sample No. SCR-14

Magnetite, pyroxene, biotite silicocarbonatite.

Field Description. Fine to medium grained, equigranular. The rock is somewhat inhomogeneous with irregular, white, carbonate segregations. Weathered surfaces are brown, fresh surfaces black. The rock is mica-rich. A large sample was taken to ensure representative analysis. The sample was taken from a resistant clot in carbonatite soil. Map unit 2b.

Petrographic Description. Fine grained, massive, equigranular, hypidiomorphic. Carbonate forms anhedral, interlocking grains. Biotite forms anhedral grains; some of the larger grains have turbid, brown cores commonly containing oriented, platey, opaque inclusions which occur in 3 sets at 60° to each other. Other biotite grains have brown to pale brown cores and reddish brown rims. These grains may poikilitically enclose magnetite. Pyroxene is anhedral to subhedral, colourless, and uncommonly encloses biotite and carbonate. The clinopyroxene is diopsidic augite. Magnetite forms anhedral to euhedral grains disseminated throughout.

Reference No. 1120
Sample No. SCR16

Magnetite, phlogopite, carbonate, perovskite silicocarbonatite.

Field Description. Fine grained, equigranular, massive. Cleavage flashes in sunlight suggest large oikocrysts of carbonate with abundant poikilitic inclusions. Weathered and fresh surfaces are black. The sample was taken from a resistant clot in carbonatite soil. Map unit 2b.

Petrographic Description. Fine grained, massive, equigranular, hypidiomorphic. Magnetite is subhedral and scattered throughout. Perovskite is euhedral and commonly has opaque cores and very weakly translucent rims. Phlogopite forms anhedral to euhedral crystals that are pleochroic from colourless to pale brown. Carbonate is anhedral and interstitial. The thin section displays banding on the order of 1 cm which is not apparent in hand sample.

Reference No. 1121
Sample No. SCR-17

Pyrochlore-bearing, magnetite silicocarbonatite.

Field Description. Fine to coarse grained, massive, inequigranular-seriate. The sample was taken from area of highest radioactivity in trench. Rock is probably cumulate. Weathered surfaces are coated with brown caliche, fresh surfaces are mottled black and white. Radioactivity in trench approaches 4 to 5 times background. Map unit 2b.

Petrographic Description. Fine to medium grained, massive, inequigranular-seriate, hypidiomorphic. Chondrodite is ragged in outline and encloses irregular, anhedral, carbonate grains; sometimes it is associated with ragged biotite. Magnetite is subhedral to euhedral and may enclose apatite and phlogopite. Phlogopite is anhedral to subhedral and scattered throughout. Phlogopite is pleochroic in pale brown to almost colourless; some grains have faint brown pleochroism to their rims and are thus weakly zoned. Apatite forms anhedral, rounded grains which are closely associated with magnetite and are scattered throughout the carbonate. Apatite tends to occur in clusters. Pyrochlore forms dark brown subhedral grains which occur isolated within carbonate or perched on edges of magnetite grains. Larger crystals may enclose blebs of carbonate. Some grains display a series of fractures radiating out from the grain into the enclosing carbonate. Carbonate is anhedral, interlocking, and interstitial.

Reference No. 1122
Sample No. SCR-27

Amphibole, magnetite, phlogopite, olivine silicocarbonatite.

Field Description. Fine to medium grained, massive, equigranular. Weathered surfaces are grey brown, fresh surfaces black. Mica is common. The sample was taken from a resistant lump in carbonatite soil. Map unit 2b.

Petrographic Description. Fine to medium grained, massive, equigranular, hypidiomorphic. Olivine forms anhedral to euhedral crystals and is relatively fresh. Traces of chondrodite occur on margins of some grains. Amphibole forms acicular, euhedral crystals within carbonate and along margins of olivine grains. Phlogopite forms anhedral to euhedral, tabular grains. Finer grained material occurs as fine grained aggregates. Larger grains are zoned. Pleochroism varies from pale brown to brown cores to brown to reddish brown rims. Magnetite is anhedral to euhedral, disseminated throughout, and closely associated with amphibole and phlogopite. Carbonate is anhedral and interstitial.

Reference No. 1123
Sample No. WPT-4

Magnetite, chondrodite, amphibole, biotite silicocarbonatite.

Field Description. Fine grained, massive, equigranular. Needle-like tufts of amphibole are abundant. Mica is abundant. Weathered surfaces are brownish black, fresh surfaces black. The sample was taken from a resistant clot in soil.

Petrographic Description. Fine to medium grained, massive, equigranular, hypidiomorphic. Amphibole occurs as pleochroic, pale green, euhedral, needle-like crystals. Magnetite is anhedral to euhedral and disseminated throughout. Biotite forms euhedral to anhedral, ragged crystals with pale brown, phlogopitic cores and reddish brown, biotitic rims. It contains poikilitic magnetite and some (001) cleavages are bent. Chondrodite forms anhedral grains pleochroic in bright yellow and yellowish brown. Chondrodite encloses amphibole crystals and magnetite.

Reference No. 1124
Sample No. WPT-17

Perovskite-bearing, apatite, magnetite, olivine, pyroxene, phlogopite silicocarbonatite.

Field Description. Fine to medium grained, massive, inequigranular-seriate. Carbonate is slightly clotty. Mica is abundant. Weathered and fresh surfaces are mottled black (mafics) and

white (carbonate). The sample was taken from a resistant clot in carbonatite soil. Map unit 2b.

Petrographic Description. Fine grained, massive, equigranular, hypidiomorphic. Perovskite forms euhedral grains, isolated and in association with magnetite. Magnetite is anhedral to euhedral and disseminated throughout. Olivine is anhedral to euhedral and relatively fresh with chlorite and serpentine alteration along curved fractures. The pyroxene is a colourless clinopyroxene. Optically it is a diopsidic augite. Phlogopite forms anhedral to subhedral grains. Some grains are rounded-elongate. Apatite grains tend to be clustered. Carbonate is anhedral, interlocking and interstitial.

Reference No. 1125
Sample No. WTR-18A

Sovite.

Field Description. Fine grained, equigranular, cream white, pure carbonate. The sample forms a resistant clot in carbonatite soil. Map unit 2a.

Petrographic Description. Fine to medium grained, massive, equigranular, allotriomorphic, with straight to curved grain boundaries. Carbonate forms an interlocking mosaic of anhedral grains.

Reference No. 1126
Sample No. WPT-18B

Magnetite, amphibole, biotite silicocarbonatite.

Field Description. Fine grained, equigranular, massive. Weathered surfaces are brown. The sample was taken from a resistant clot in carbonatite soil. Map unit 2b.

Petrographic Description. Fine grained, equigranular, massive, hypidiomorphic. Magnetite forms anhedral to euhedral, disseminated grains. Amphibole forms needle-like, euhedral crystals which occur with carbonate and may interlock with biotite. Biotite forms anhedral to euhedral, brown, tabular crystals; larger grains are pleochroic with pale brown to dark brown cores and brown to reddish brown rims. Carbonate is anhedral, interlocking and interstitial.

Reference No. 1127
Sample No. WPT-27

Chondrodite-bearing, magnetite, amphibole, phlogopite silicocarbonatite.

Field Description. Fine to medium grained, equigranular, massive. Mica is common. Weathered surfaces are grey-brown, fresh surfaces mottled black (mafics) and white (carbonate). The sample was taken from a resistant clot in carbonatite soil. Map unit 2b.

Petrographic Description. Fine grained, massive, equigranular, hypidiomorphic. Olivine forms anhedral to subhedral grains. Some edges are ragged and locally altered to chondrodite and fine grained magnetite. Amphibole is euhedral, acicular and pleochroic in pale green. It commonly occurs as fine grained, interlocking aggregates. Chondrodite is minor and occurs rimming and replacing olivine in spotty fashion. Phlogopite forms anhedral to euhedral grains with some zoning. It is pleochroic, with pale brown to brown cores and pale brown to reddish brown rims. Magnetite is anhedral to euhedral and disseminated throughout. Some magnetite is fine grained, anhedral, and crudely outlines olivine grains. Anhedral magnetite is enclosed in olivine and amphibole grains. Carbonate is anhedral and interstitial.

Reference No. 1128
Sample No. WPT-28A

Sovite.

Field Description. Fine to medium grained, inequigranular-seriate. Weathered and fresh surfaces are grey. Carbonate and silicate fractions are somewhat clotty. The sample was taken from resistant clot in carbonatite soil. Map unit 2a.

Petrographic Description. Fine to medium grained, massive, equigranular, hypidiomorphic. Phlogopite forms very pale brown, tabular grains which may poikilitically enclose carbonate and magnetite. Magnetite forms anhedral to euhedral crystals; sometimes it is skeletal with braided to branching magnetite bands alternating with carbonate. Amphibole is minor and occurs as very small, needle-like crystals. Olivine is anhedral to euhedral, commonly skeletal and forms eutectic-like intergrowths with carbonate. Trace to minor amounts of chondrodite occur as patches along margins of some olivine grains. Chondrodite is pleochroic in pale to dark yellow. Carbonate is anhedral, interlocking and interstitial. The rock is very unusual in that olivine content is estimated to be nearly 50%, the remainder is dominantly carbonate and magnetite.

Reference No. 1129
Sample No. SR-18

Magnetite, amphibole, biotite-phlogopite, chondrodite silicocarbonatite.

Field Description. Fine grained, massive, equigranular. The rock forms a ridge weathering in relief across Schryburt Creek. The ridge at the head of the rapids and the rock represent a narrow, irregular, perhaps discontinuous band in sovitic rocks. The sample was taken from outcrop in creek bed. The sample contains mica and some magnetite. Rock looks similar to inclusions in sovite and may be a dismembered dike rock. Map unit 2b.

Petrographic Description. Fine grained, massive, equigranular, hypidiomorphic. Carbonate forms anhedral, interstitial grains. Chondrodite is anhedral and interlocking with amphibole and magnetite; it likely replaces olivine. Pleochroism is pale yellow to dark yellow. Biotite-phlogopite forms anhedral to euhedral, pleochroic crystals, which are zoned with (1) pale brown cores and reddish brown rims and (2) brown cores and pale brown rims. Amphibole forms acicular, euhedral crystals. Amphibole is abundant and forms a criss-crossing network of fibres. Crystals may completely cross-cut chondrodite. Magnetite is anhedral to subhedral, disseminated, and locally is enclosed in chondrodite.

Reference No. 1132
Sample No. SR18-3

Magnetite, amphibole, biotite, apatite sovite.

Field Description. Fine to coarse grained, foliated, pink to buff. Rock is 85-90% carbonate. Foliation is defined by platey magnetite-ilmenite and euhedral crystals of phlogopite. Vitreous green apatite is common. The sample was taken from slab on bank of Schryburt Creek. Some dark streaks or fractures were removed before analysis. Fractures are less than 1 mm in width. Map unit 2a.

Petrographic Description. Fine to medium grained, massive, inequigranular-seriate, hypidiomorphic. Minerals tend to be concentrated into bands defining a foliation. Magnetite is anhedral, disseminated and sometimes platey. Biotite forms anhedral to euhedral crystals which are commonly strongly zoned with pleochroic, light to dark brown cores and reddish brown rims. Amphibole forms needle-like, euhedral crystals. Apatite forms rounded to rounded-elongate crystals, anhedral to subhedral in form. Carbonate forms an interlocking mosaic of anhedral grains.

Reference No. 1133
Sample No. SR18-4

Pyrrhotite-bearing amphibole, biotite, apatite sovite.

Field Description. Fine to medium grained, massive, inequigranular-seriate, banded. Bands due to variations in relative accessory mineral content are on the order of 1-2 cm wide and diffuse into each other. Minor mica is subhedral. Traces of disseminated magnetite and pyrrhotite are present. The sample was taken from slab of carbonatite on Schryburt Creek. Map unit 2a.

Petrographic Description. Fine to medium grained, massive, equigranular. Various minerals appear to be concentrated in bands. Apatite forms anhedral, rounded to rounded-elongate crystals. Pyrrhotite forms irregular, anhedral, elongate grains. Biotite forms anhedral to euhedral, tabular crystals. Pleochroism varies from pale brown cores to dark reddish brown rims. Amphibole forms euhedral, needle-like crystals pleochroic in pale green. Carbonate grains form an interlocking mosaic.

Reference No. 1134
Sample No. SR18-5

Magnetite, amphibole, biotite, apatite sovite.

Field Description. Fine to medium grained, banded, inequigranular-seriate. Bands are 1 to 4 cm wide with gradational contacts. Rock contains green actinolite needles, vitreous green apatite, traces of disseminated pyrrhotite and magnetite, and scattered euhedral mica crystals. The sample was taken from slab of carbonatite in Schryburt Creek. Map unit 2a.

Petrographic Description. Fine grained, massive, equigranular, hypidiomorphic. Amphibole forms euhedral, needle-like crystals. Biotite forms tabular crystals, anhedral to euhedral in form with pleochroic, pale brown to brown cores and dark reddish brown rims. In places it poikilitically encloses magnetite. Apatite forms anhedral, rounded to rounded-elongate grains. Magnetite is anhedral to euhedral, disseminated and commonly interlocking with biotite. Carbonate forms an interlocking mosaic of grains.

Reference No. 1136
Sample No. SR18-7

Magnetite-bearing, biotite, apatite sovite.

Field Description. Fine to medium grained, equigranular. Pinkish carbonate forms more than 90% of rock. Euhedral phlogopite is up to 2 mm in diameter. Minor magnetite and traces of pyrrhotite are present. The sample was taken from carbonatite slab in Schryburt Creek. Map unit 2a.

Petrographic Description. Fine to medium grained, massive, equigranular, hypidiomorphic. Magnetite is euhedral and disseminated. Biotite forms tabular, subhedral crystals with pale brown to brown cores and reddish brown rims. Biotite and carbonate grains locally have cuspate grain boundaries. Apatite is anhedral forming rounded to rounded-elongate grains. Carbonate forms an interlocking mosaic of anhedral grains.

Reference No. 1137
Sample No. SR18-8

Magnetite, biotite, apatite sovite.

Field Description. Fine to medium grained, inequigranular-seriate. Pink carbonate-rich bands alternate with grey bands with higher accessory mineral content. Banding is discontinuous on the order of 1 to several centimeters in width. The rock contains euhedral magnetite crystals up to 2 mm wide, scattered phlogopite and traces of pyrrhotite. The sample was taken from carbonatite slab in Schryburt Creek. Map unit 2a.

Petrographic Description. Fine to medium grained, massive, equigranular, hypidiomorphic. Magnetite forms anhedral to euhedral, disseminated grains. Biotite forms anhedral to euhedral, tabular to ragged grains with pleochroic, pale brown to brown cores and reddish brown rims. Apatite is anhedral, forming rounded to rounded-elongate crystals. Carbonate forms an interlocking mosaic of anhedral crystals.

Reference No. 1138
Sample No. SR18-9

Chondrodite, amphibole, magnetite, apatite, biotite sovite.

Field Description. Fine to medium grained, massive to slightly foliated, banded, inequigranular-seriate. The sample was taken from slab of carbonatite at edge of Schryburt Creek. Map unit 2a.

Petrographic Description. Fine to medium grained, massive, equigranular, hypidiomorphic. Chondrodite occurs as anhedral grains with pale yellow to dark yellow pleochroism. It contains poikilitic apatite, abundant amphibole and minor biotite. These mineral aggregates may represent complete olivine breakdown(?). Amphibole forms euhedral, acicular crystals with pale green pleochroism. Biotite forms anhedral to euhedral crystals with pale brown to dark brown cores and dark brown to reddish brown rims. Magnetite is anhedral to euhedral and disseminated. Apatite is anhedral to subhedral and rounded to rounded-elongate. Carbonate forms an interlocking mosaic of anhedral grains.

Reference No. 1139
Sample No. SR18-10

Amphibole, biotite, magnetite, chondrodite, apatite sovite.

Field Description. Fine to medium grained, inequigranular-seriate, with diffuse banding. Magnetite, and phlogopite are present. The sample was taken from carbonatite slab on edge of Schryburt Creek. Map unit 2a.

Petrographic Description. Fine to medium grained, massive, equigranular, hypidiomorphic. Chondrodite forms anhedral grains with poikilitic apatite and magnetite and rare blebs of carbonate. It may have resulted from olivine breakdown(?). Amphibole forms euhedral, acicular crystals, occasionally isolated, but commonly within and penetrating chondrodite. Apatite forms anhedral, rounded to rounded-elongate crystals. Biotite is pleochroic with pale brown to dark brown cores and brown to reddish brown rims. Biotite occurs as anhedral to euhedral grains. Magnetite is anhedral to euhedral and disseminated. Carbonate forms an interlocking mosaic of anhedral crystals.

TABLE A-2. MAJOR ELEMENT ANALYSES (WEIGHT PERCENT) OF WHOLE-ROCK SAMPLES FROM THE SCHRYBURT LAKE CARBONATITE COMPLEX.

	Sovite (2a)						
Ref. No.	**1108**	**1113**	**1116**	**1125**	**1128**	**1110**	**1132**
SiO_2	0.76	0.00	4.49	1.00	14.90	2.72	2.38
Al_2O_3	1.23	0.00	0.10	0.20	0.90	12.10	0.52
Fe_2O_3	0.00	0.75	5.09	0.10	9.31	0.04	1.27
FeO	1.59	0.52	3.43	0.63	5.66	2.03	1.85
MgO	2.10	2.00	5.20	2.80	18.80	4.31	3.61
CaO	53.00	52.30	45.60	51.00	27.20	44.00	47.00
Na_2O	0.05	0.03	0.11	0.11	0.16	0.05	0.43
K_2O	0.06	0.06	0.07	0.92	0.29	0.07	0.28
TiO_2	0.00	0.00	0.20	0.10	0.80	0.38	0.12
P_2O_5	0.16	0.61	2.14	0.06	2.27	0.33	2.80
S	0.04	0.00	0.08	0.01	0.09	0.05	0.26
MnO	0.19	0.13	0.23	0.30	0.49	0.23	0.18
CO_2	41.20	41.90	33.10	42.50	19.70	34.20	35.50
H_2O+	0.02	0.02	0.17	0.00	0.00	0.20	0.00
H_2O-	0.02	0.03	0.53	0.34	0.60	0.02	0.41
Total	100.40	98.40	101.30	100.20	101.50	100.80	96.6

	Sovite (2a)						Silico-carbon-atite (2b)
Ref. No.	**1133**	**1134**	**1136**	**1137**	**1138**	**1139**	**1109**
SiO_2	2.52	3.38	2.01	2.73	3.71	3.50	21.50
Al_2O_3	0.54	0.56	0.44	0.52	0.42	0.36	6.98
Fe_2O_3	0.14	1.84	1.14	2.40	1.85	1.51	7.95
FeO	1.53	2.09	0.64	2.98	2.17	1.61	5.43
MgO	2.37	4.43	1.85	3.10	5.58	5.24	12.80
CaO	48.40	45.80	50.80	46.80	45.20	45.00	25.70
Na_2O	0.46	0.43	0.47	0.43	0.41	0.47	0.54
K_2O	0.31	0.41	0.12	0.37	0.22	0.26	1.82
TiO_2	0.02	0.14	0.00	0.19	0.15	0.11	4.34
P_2O_5	1.66	2.64	3.52	2.48	2.68	2.12	0.15
S	0.34	0.23	0.12	0.42	0.26	0.10	0.13
MnO	0.13	0.19	0.13	0.20	0.22	0.21	0.26
CO_2	36.70	37.20	38.00	38.00	37.30	34.00	11.80
H_2O+	0.00	0.00	0.00	0.00	0.00	0.00	0.28
H_2O-	0.49	0.50	0.28	0.40	0.51	0.45	0.05
Total	95.9	99.8	99.5	101.0	100.8	94.9	99.8

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
1108	HEF13-1A	1133	SR18-4
1113	HEF13-11	1134	SR18-5
1116	SCR-9	1136	SR18-7
1125	WTR-18A	1137	SR18-8
1128	WPT-28A	1138	SR18-9
1110	HEF13-6A1	1139	SR18-10
1132	SR18-3	1109	HEF13-3

TABLE A-2. CONTINUED.

	Silicocarbonatite (2b)							
Ref. No.	1111	1121	1115	1117	1118	1119	1120	1122
SiO_2	22.30	4.60	28.50	26.80	29.80	26.50	5.00	26.60
Al_2O_3	6.46	1.00	1.00	1.30	2.50	4.80	1.50	2.00
Fe_2O_3	8.72	41.0	9.24	10.40	7.82	5.07	15.10	7.18
FeO	7.61	18.2	3.92	2.94	7.00	4.26	7.83	5.60
MgO	19.50	6.20	25.40	22.60	21.00	14.20	5.20	21.20
CaO	15.70	15.0	8.00	9.40	13.60	21.40	26.80	17.80
Na_2O	0.74	0.11	0.43	0.51	1.51	0.92	0.35	1.19
K_2O	2.21	0.56	5.74	6.27	2.63	4.00	0.82	1.45
TiO_2	3.87	0.50	3.40	3.10	2.80	3.00	27.80	3.00
P_2O_5	0.14	4.13	0.12	0.09	1.63	2.11	0.71	1.92
S	0.36	0.01	0.31	0.13	0.34	0.08	0.01	0.32
MnO	0.53	0.59	0.36	0.30	0.36	0.23	0.40	0.31
CO_2	10.20	7.20	11.10	13.70	7.76	10.30	6.50	8.60
H_2O+	0.50	0.00	0.24	0.06	0.11	0.20	0.02	0.47
H_2O-	0.02	0.30	0.59	0.49	0.52	0.52	0.41	0.42
Total	99.0	99.6	98.5	98.3	99.6	97.8	98.7	98.8

	Silicocarbonatite (2b)					Rauhaugite (2c)	Misc.
Ref. No.	1123	1124	1126	1127	1129	1112	1114
SiO_2	26.50	22.30	27.20	27.00	26.70	0.20	0.64
Al_2O_3	2.00	2.90	1.40	2.10	1.50	2.15	4.91
Fe_2O_3	9.57	6.47	10.90	7.61	8.28	0.10	0.29
FeO	5.52	5.88	3.08	6.65	5.15	1.52	1.44
MgO	25.00	14.20	22.80	21.20	24.10	18.80	17.40
CaO	8.60	25.20	9.20	17.20	10.90	30.60	29.20
Na_2O	1.08	0.49	0.57	1.05	1.31	0.09	0.14
K_2O	3.26	1.81	6.27	1.37	1.82	0.07	0.07
TiO_2	4.50	4.30	3.40	2.60	5.77	0.00	0.00
P_2O_5	0.24	1.31	0.15	1.50	0.66	0.04	0.16
S	0.55	0.14	0.34	0.31	0.06	0.01	0.06
MnO	0.52	0.25	0.34	0.30	0.23	0.62	0.76
CO_2	9.85	13.10	13.70	8.20	9.50	44.40	43.80
H_2O+	0.23	0.20	0.40	0.24	0.74	0.07	0.01
H_2O-	0.47	0.59	0.36	0.73	0.40	0.03	0.02
Total	98.0	99.5	100.3	98.24	97.0	98.7	98.9

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
1111	HEF13-7	1123	WPT-4
1121	SCR-17	1124	WPT-17
1115	SCR-8	1126	WTR-18B
1117	SCR-11	1127	WPT-27
1118	SCR-13	1129	SR-18
1119	SCR-14	1112	HEF13-9
1120	SCR-16	1114	HEF13-24
1122	SCR-27		

TABLE A-3. TRACE ELEMENT ANALYSES (PPM) OF WHOLE-ROCK SAMPLES FROM THE SCHRYBURT LAKE CARBONATITE COMPLEX.

	Sovite (2a)						
Ref. No.	1108	1113	1116	1125	1128	1110	1132
Ag	1	<1	<1	<1	1	<1	<1
Au							
As							
Ba	400	600	500	630	300	500	670
Be	<3	<3	<1	<1	<1	<3	<1
Bi							
Co	<4	<4	10	<5	50	9	12
Cr	<10	<10	15	5	5	<10	<5
Cu	7	6	20	10	40	20	20
Ga	<5	<5	4	<1	15	<5	3
Hg							
Li	<20	<20	5	<3	5	<20	<3
Mn							
Mo	<10	<10	<1	<1	<1	<10	<1
Nb	300	<100	150	<30	<30	300	600
Ni	8	10	<5	<5	45	10	<5
Pb	<10	<10	10	40	<10	10	18
Rb	10	<10				<10	10
Sb							
Sc	<20	<20	50	10	50	40	20
S	<10	<10	5	5	8	<10	3
Sr	6000	5000	6000	9000	2800	6500	9000
Ti							
V	<10	10	300	<5	100	400	100
Y	100	70	80	50	40	80	100
Zn	10	10	100	10	180	90	37
Zr	100	<10	900	<10	200	700	200
La	<200	<200	700	500	350	<200	400
Nd			400	300	400		400
Ce	<1000	<1000	500	<500	<500	<1000	640
Eu							<100
Yb							4

Notes: For sample descsriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
1108	HEF13-1A	1128	WPT-28A
1113	HEF13-11	1110	HEF13-6A1
1116	SCR-9	1132	SR18-3
1125	WTR-18A		

TABLE A-3. CONTINUED.

	Sovite (2a)						Silico-carbon-atite (2b)
Ref. No.	1133	1134	1136	1137	1138	1139	1109
Ag	<1	<1	<1	<1	<1	<1	<1
Au							
As							
Ba	870	620	600	550	600	690	800
Be	<1	<1	<1	<1	<1	<1	<3
Bi							
Co	12	11	<5	14	10	6	50
Cr	6	<5	<5	10	<5	6	450
Cu	12	28	14	18	13	10	80
Ga	4	3	2	4	2	3	20
Hg							
Li	<3	3	<3	4	4	4	<20
Mn							
Mo	<1	<1	<1	<1	<1	<1	<10
Nb	100	150	50	100	300	450	500
Ni	<5	<5	<5	<5	<5	<5	370
Pb	26	25	11	18	46	40	<10
Rb	10	10	10	10	<10	<10	30
Sb							
Sc	15	25	8	10	35	50	30
Sn	<3	<3	<3	<3	3	<3	<10
Sr	9000	8000	9500	1.0%	1.0%	1.0%	1300
Ti							
V	25	150	15	200	150	100	350
Y	100	100	100	100	90	90	60
Zn	18	47	12	60	61	56	130
Zr	80	500	10	150	3500	7000	700
La	450	400	450	450	350	350	<200
Nd	300	400	350	450	600	600	
Ce	620	680	700	730	680	720	<1000
Eu	<100	<100	<100	<100	<100	<100	
Yb	3	3	4	4	4	4	

Notes: For sample descsriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
1133	SR18-4	1138	SR18-9
1134	SR18-5	1139	SR18-10
1136	SR18-7	1109	HEF13-3
1137	SR18-8		

TABLE A-3. CONTINUED.

	Silicocarbonatite (2b)							
Ref. No.	**1111**	**1121**	**1115**	**1117**	**1118**	**1119**	**1120**	**1122**
Ag	<1	<1	<1	<1	<1	<1	<1	<1
Au								
As								
Ba	500	360	60	170	560	2320	750	550
Be	3	1	10	15	7	6	<1	2
Bi								
Co	60	45	105	110	100	40	55	110
Cr	800	5	320	160	1040	15	2120	860
Cu	70	10	65	35	95	350	40	150
Ga	20	40	8	6	15	20	15	10
Hg								
Li	<20	5	25	20	5	5	5	5
Mn								
Mo	<10	15	<1	<1	<1	<1	6	<1
Nb	1500		100	110	600	400	>0.1%	200
Ni	660	<5	1340	1240	840	65	85	880
Pb	<10	30	<10	10	10	10	30	<10
Rb	40							
Sb								
Sc	20	60	15	15	40	50	40	15
Sn	<10	25	<3	<3	8	7	9	4
Sr	1300	1600	1400	1500	1400	2100	2000	1500
Ti								
V	350	1000	100	70	300	200	350	90
Y	60	30	<10	<10	35	50	400	45
Zn	210	640	125	105	180	140	200	125
Zr	400	600	150	100	600	600	700	350
La	<200		<100	<100	300	500	>0.1%	500
Nd			<300	<300	<300	600	>0.1%	300
Ce	<1000		<500	<500	<500	500	4000	500

Notes: For sample descsriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
1111	HEF13-7	1118	SCR-13
1121	SCR-17	1119	SCR-14
1115	SCR-8	1120	SCR-16
1117	SCR-11	1122	SCR-27

TABLE A-3. CONTINUED.

	Silicocarbonatite (2b)					Rauhaugite (2c)	Misc.
Ref. No.	1123	1124	1126	1127	1129	1112	1114
Ag	<1	<1	<1	<1	<1	<1	<1
Au							
As							
Ba	340	640	290	510	450	150	1500
Be	8	3	15	2	5	<3	<3
Bi							
Co	75	60	105	110	85	<4	6
Cr	1100	580	155	1000	1180	<10	<10
Cu	60	75	65	155	250	6	6
Ga	15	15	10	10	5	<5	<5
Hg							
Li	5	5	25	5	6	<20	<20
Mn							
Mo	<1	<1	<1	<1	<1	<10	<10
Nb	700	300	150	300	150	<100	500
Ni	960	520	1200	860	840	10	10
Pb	10	10	<10	<10	75	<10	<10
Rb					50	<10	<10
Sb							
Sc	50	50	30	15	15	<20	<20
Sn	10	5	<3	5	4	<10	<10
Sr	1300	2700	1600	1500	800	3500	5000
Ti							
V	250	150	100	150	250	<10	30
Y	15	45	<10	45	40	<20	<20
Zn	195	135	140	135	80	20	40
Zr	250	400	200	350	200	<10	100
La	<100	600	<100	450	150	<200	<200
Nd	<300	500	<300	<300	<100		
Ce	<500	<500	<500	600	1180	<1000	<1000
Eu					<100		
Yb					2		

Notes: For sample descsriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
1123	WPT-4	1129	SR-18
1124	WPT-17	1112	HEF13-9
1126	WTR-18B	1114	HEF13-24
1127	WPT-27		

TABLE A-4. NORMATIVE MINERALS (ALKALIC ROCKS) FOR WHOLE-ROCK SAMPLES FROM THE SCHRYBURT LAKE CARBONATITE COMPLEX.

	Sovite (2a)						
Ref. No.	**1108**	**1113**	**1116**	**1125**	**1128**	**1110**	**1132**
QZ	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO	0.90	0.0	0.0	0.06	0.59	12.03	0.22
OR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AB	0.0	0.0	0.0	0.24	0.0	0.0	0.0
LC	0.0	0.0	0.0	0.0	0.63	0.0	0.0
KAL	0.20	0.0	0.23	0.0	0.52	0.23	0.94
NEPH	0.0	0.0	0.0	0.25	0.0	0.0	0.0
CAR	0.0	0.0	0.0	0.02	0.0	0.0	0.0
NS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AC	0.0	0.22	0.0	0.0	0.0	0.0	0.0
TH	0.11	0.0	0.25	0.09	0.37	0.11	0.99
GEH	0.71	0.0	0.07	0.0	0.0	0.0	0.0
AKM	3.66	1.71	2.02	0.0	0.0	3.54	0.55
FE-AK	1.94	0.58	0.33	0.0	0.0	1.16	0.23
D.WO	-4.59	-1.90	-1.07	0.0	0.0	-3.89	-0.64
D.EN	-2.68	-1.25	-0.80	0.0	0.0	-2.60	-0.40
D.FS	-1.68	-0.51	-0.16	0.0	0.0	-1.00	-0.20
FO	4.58	1.55	9.07	0.82	31.53	8.38	4.01
FA	3.18	0.69	1.96	1.26	2.79	3.57	2.15
ANDR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HM	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MT	0.0	0.98	7.39	0.15	13.52	0.06	1.84
SPH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PERV	0.0	0.0	0.34	0.0	0.0	0.0	0.0
RU	0.0	0.0	0.0	0.10	0.80	0.38	0.12
AP	0.38	1.44	5.07	0.14	5.37	0.78	6.63
CC	93.62	91.83	75.21	90.80	43.17	77.68	77.23
MGS	0.0	2.84	0.0	4.85	1.34	0.02	2.88
FL	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ZR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BAD	0.0	0.0	0.0	0.0	0.0	0.0	0.0
H_2O	0.04	0.05	0.70	0.34	0.60	0.22	0.41
SUM	100.37	98.23	100.62	99.11	101.23	100.68	96.96

QZ - Quartz; CO - Corundum; OR - Orthoclase; AB - Albite; LC - Leucite;
KAL - Kalsilite; NEPH - Nepheline; CAR - Carnegieite; NS - Na_2SiO_3; AC - Acmite;
TH - Thenardite; GEH - Gehlenite; AKM - Akermanite; FE-AK - Fe-Akermanite;
D.WO - Wollastonite; D.EN - Enstatite; D.FS - Ferrosilite; FO - Forsterite;
FA - Fayalite; ANDR - Andradite; HM - Hematite; MT - Magnetite;
SPH - Sphene; PERV - Perovskite; RU - Rutile; AP - Apatite; CC - Calcite;
MGS - Magnesite; FL - Fluorite; ZR - Zircon; BAD - Baddeleyite

Note: For sample descriptions, see Table A-1. Alkalic norms were calculated using the method of LeBas (1973).

Ref. No.	Sample No.	Ref. No.	Sample No.
1108	HEF13-1A	1128	WPT-28A
1113	HEF13-11	1110	HEF13-6A1
1116	SCR-9	1132	SR18-3
1125	WTR-18A		

TABLE A-4. CONTINUED.

	Sovite (2a)						Silico-carbon-atite (2b)
Ref. No.	1133	1134	1136	1137	1138	1139	1109
QZ	0.0	0.62	1.27	0.43	1.29	0.0	0.0
CO	0.20	0.12	0.31	0.12	0.18	0.08	0.0
OR	0.0	2.42	0.71	2.18	1.30	0.0	0.0
AB	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LC	1.03	0.0	0.0	0.0	0.0	0.0	0.0
KAL	0.29	0.0	0.0	0.0	0.0	0.87	5.61
NEPH	0.0	0.0	0.0	0.0	0.0	0.0	1.81
CAR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TH	1.05	0.99	1.08	0.99	0.94	1.08	0.58
GEH	0.0	0.0	0.0	0.0	0.0	0.0	12.19
AKM	0.0	0.0	0.0	0.0	0.0	1.63	0.0
FE-AK	0.0	0.0	0.0	0.0	0.0	0.26	0.0
D.WO	0.0	0.0	0.0	0.0	0.0	-1.59	5.03
D.EN	0.0	0.0	0.0	0.0	0.0	-1.20	3.81
D.FS	0.0	0.0	0.0	0.0	0.0	-0.23	0.69
FO	3.43	1.35	0.40	0.0	2.38	8.12	19.56
FA	2.27	2.06	0.37	2.99	2.22	1.71	3.89
ANDR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HM	0.0	0.0	0.0	0.0	0.0	0.0	2.22
MT	0.20	2.67	1.66	3.49	2.69	2.19	8.33
SPH	0.0	0.0	0.0	0.0	0.0	0.0	3.90
PERV	0.0	0.0	0.0	0.0	0.0	0.0	4.68
RU	0.02	0.14	0.0	0.19	0.15	0.11	0.0
AP	3.93	6.25	8.33	5.87	6.34	5.02	0.36
CC	82.41	75.47	82.32	77.63	74.31	75.26	26.81
MGS	0.83	7.61	3.38	6.46	8.78	1.67	0.0
FL	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ZR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BAD	0.0	0.0	0.0	0.0	0.0	0.0	0.0
H_20	0.49	0.50	0.28	0.40	0.51	0.45	0.33
SUM	96.16	100.20	100.10	100.74	101.08	95.45	99.80

Note: For sample descriptions, see Table A-1. Alkalic norms were calculated using the method of LeBas (1973).

Ref. No.	Sample No.	Ref. No.	Sample No.
1133	SR18-4	1138	SR18-9
1134	SR18-5	1139	SR18-10
1136	SR18-7	1109	HEF13-3
1137	SR18-8		

TABLE A-4. CONTINUED.

	Silicocarbonatite (2b)							
Ref. No.	**1111**	**1121**	**1115**	**1117**	**1118**	**1119**	**1120**	**1122**
QZ	0.0	0.0	9.34	9.72	2.02	0.0	0.0	0.0
CO	1.71	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OR	0.0	0.0	5.45	7.09	13.63	0.0	0.0	4.19
AB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LC	6.33	0.0	0.0	0.0	0.0	0.0	0.0	3.43
KAL	2.75	1.76	0.0	0.0	0.0	12.93	2.19	0.0
NEPH	0.28	0.45	0.0	0.0	0.0	1.80	2.08	0.0
CAR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AC	0.0	0.0	0.0	0.0	0.0	1.84	0.0	0.0
TH	1.59	0.09	0.99	1.17	3.46	0.89	0.04	2.73
GEH	6.15	0.74	0.0	0.0	0.0	0.0	0.18	1.16
AKM	0.0	3.48	0.0	0.0	0.0	0.0	3.16	0.0
FE-AK	0.0	0.12	0.0	0.0	0.0	0.0	0.55	0.0
D.WO	0.0	-3.05	0.0	0.0	0.0	7.80	-3.10	2.72
D.EN	0.0	-2.55	0.0	0.0	0.0	5.71	-2.32	2.19
D.FS	0.0	-0.11	0.0	0.0	0.0	1.34	0.48	0.20
FO	33.86	11.66	36.24	29.04	36.47	20.66	9.84	35.28
FA	6.00	0.54	0.18	0.0	5.46	5.34	2.23	3.65
ANDR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HM	0.0	0.0	0.0	1.66	0.0	4.44	0.0	0.0
MT	12.67	59.56	13.42	12.70	11.36	0.0	21.94	10.43
SPH	0.0	0.0	0.0	0.0	5.47	4.42	0.0	8.83
PERV	0.0	0.20	0.0	0.0	0.0	2.04	42.46	0.0
RU	3.87	0.38	3.40	3.10	0.57	0.0	2.86	0.0
AP	0.33	9.78	0.28	0.21	3.86	4.99	1.68	4.54
CC	23.18	16.36	13.98	16.55	17.63	22.72	14.77	19.54
MGS	0.0	0.0	9.44	12.25	0.0	0.0	0.0	0.0
FL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ZR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BAD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
H_2O	0.52	0.30	0.83	0.55	0.63	0.72	0.43	0.89
SUM	99.24	99.71	93.57	94.05	100.56	97.66	98.51	99.78

Note: For sample descriptions, see Table A-1. Alkalic norms were calculated using the method of LeBas (1973).

Ref. No.	Sample No.	Ref. No.	Sample No.
1111	HEF13-7	1118	SCR-13
1121	SCR-17	1119	SCR-14
1115	SCR-8	1120	SCR-16
1117	SCR-11	1122	SCR-27

TABLE A-4. CONTINUED.

	Silicocarbonatite (2b)					Rauhaugite (2c)	Misc.
Ref. No.	1123	1124	1126	1127	1129	1112	1114
QZ	2.35	0.0	9.77	0.0	0.0	0.0	0.0
CO	0.0	0.0	0.0	0.0	0.0	1.96	4.80
OR	10.91	0.0	7.63	1.18	5.41	0.0	0.0
AB	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LC	0.0	0.0	0.0	5.41	2.17	0.0	0.0
KAL	0.0	6.07	0.0	0.0	0.0	0.11	0.19
NEPH	0.0	0.0	0.0	0.0	0.0	0.44	0.15
CAR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AC	0.0	0.0	0.0	0.0	7.60	0.0	0.0
TH	2.47	1.12	1.31	2.41	0.66	0.04	0.27
GEH	0.0	2.53	0.0	1.66	0.0	0.0	0.0
AKM	0.0	0.0	0.0	0.0	0.0	0.21	0.0
FE-AK	0.0	0.0	0.0	0.0	0.0	3.05	1.23
D.WO	0.0	5.64	0.0	4.70	0.0	-2.50	-0.94
D.EN	0.0	4.28	0.0	3.71	0.0	-0.15	0.0
D.FS	0.0	0.78	0.0	0.46	0.0	-2.65	-1.07
FO	38.09	21.67	29.04	34.22	39.26	0.21	0.0
FA	2.47	4.36	0.0	4.66	4.03	4.01	3.37
ANDR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HM	0.0	0.61	3.29	0.0	0.0	0.0	0.0
MT	13.90	8.51	11.06	11.06	8.21	0.15	0.42
SPH	0.0	9.80	0.0	6.38	0.0	0.0	0.0
PERV	0.0	0.52	0.0	0.0	0.0	0.0	0.0
RU	4.51	0.0	3.40	0.0	5.78	0.0	0.0
AP	0.57	3.10	0.36	3.55	1.56	0.09	0.38
CC	14.77	29.77	16.05	18.63	17.89	54.47	51.69
MGS	6.39	0.0	12.66	0.0	3.11	38.99	36.26
FL	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ZR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BAD	0.0	0.0	0.0	0.0	0.0	0.0	0.0
H_20	0.70	0.79	6.67	1.61	1.14	0.10	0.03
SUM	97.13	99.55	101.25	99.63	96.83	98.53	96.78

Note: For sample descriptions, see Table A-1. Alkalic norms were calculated using the method of LeBas (1973).

Ref. No.	Sample No.	Ref. No.	Sample No.
1123	WPT-4	1129	SR-18
1124	WPT-17	1112	HEF13-9
1126	WTR-18B	1114	HEF13-24
1127	WPT-27		

TABLE A-5. AVERAGE CHEMICAL COMPOSITIONS* (WEIGHT PERCENT AND PPM) OF LITHOLOGIC UNITS FOR THE SCHRYBURT LAKE CARBONATITE COMPLEX.

	Sovite Unit 2a (N = 14)		Silicocarbonatite Unit 2b (N = 16)	
	Mean	Std. Deviation	Mean	Std. Deviation
SiO_2	3.32	3.55	23.13	7.55
Al_2O_3	1.31	3.12	2.83	1.92
Fe_2O_3	1.27	1.35	10.45	8.50
FeO	2.05	1.33	6.20	3.52
MgO	4.65	4.26	17.74	6.34
CaO	46.38	6.22	16.94	6.68
Na_2O	0.29	0.19	0.76	0.39
K_2O	0.27	0.22	2.87	1.88
TiO_2	0.17	0.21	4.95	6.20
P_2O_5	1.88	1.14	1.13	1.09
MnO	0.19	0.05	0.34	0.12
CO_2	36.07	5.53	10.32	2.34
S	0.16	0.14	0.21	0.15
H_2O+	0.03	0.07	0.26	0.19
H_2O-	0.35	0.20	0.44	0.19
LOI	20.62	18.56	0.00	0.00
TOTAL	99.17	2.17	98.81	1.00
Ag	<0.86	0.53	<0.75	0.68
Ba	585.00	135.92	702.50	661.10
Co	9.14	13.81	75.94	27.22
Cr	<0.57	8.17	650.00	568.59
Cu	17.29	9.18	120.62	106.00
Li	<3.57	9.50	5.37	12.31
Ni	1.64	13.87	653.75	442.11
Pb	16.57	18.32	9.06	22.23
Zn	52.00	47.08	176.25	128.46
Be	<1.43	0.85	5.00	5.20
Mo	<2.93	3.83	<0.69	5.57
Sc	23.43	19.96	34.06	16.45
Sr	5700.21	3620.94	1571.43	449.66
V	116.79	119.33	253.75	221.02
Y	85.71	19.89	55.62	94.88
Ga	1.99	5.12	15.25	8.28
Nb	188.57	196.89	1043.93	2502.18
Rb	5.00	9.26	50.00	0.00
Zr	962.14	1960.80	409.37	200.18
Sn	<1.36	5.92	3.75	8.47
Eu	<100.00	0.00	<100.00	0.00
Yb	3.75	0.46	2.00	0.00
Ce	565.00	476.41	385.33	1195.98
La	300.00	284.88	853.27	2549.01
Nd	418.18	100.68	823.00	2787.24

*The average compositions may include duplicate samples or analyses which are not listed in Tables A-2 to A-4.

References

Erdosh, G.

1977: Exploration of the Schryburt Carbonatite Complex; *unpublished report prepared for* International Minerals and Chemical Corporation (Canada) Limited, 9p. plus appendix.

Freestone, I.C. and Hamilton, D.L.

1980: The Role of Liquid Immiscibility in the Genesis of Carbonatites, An Experimental Study; Contributions to Mineralogy and Petrology, vol.73, p.100-117.

Hamilton, D.L., Freestone, I.C., Dawson, J.B. and Donaldson, C.H.

1979: Origin of Carbonatites by Liquid Immiscibility; Nature, vol.279, p.52-54.

Heinrich, E. W.

1966: The Geology of Carbonatites; Rand McNally, Chicago, 555p.

Higgins, C.S.

1977: Petrography and Petrology of the Schryburt Lake Carbonatite Intrusion; *unpublished* BSc Thesis, Carleton University, Ottawa, Ontario, 50p.

LeBas, M.J.

1973: A Norm for Feldspathoidal and Melilitic Igneous Rocks; Journal of Geology, vol.81, p.89-96.

LeBas, M.J. and Handley, C.D.

1979: Variation in Apatite Composition in Ijolitic and Carbonatitic Igneous Rocks; Nature, vol.279, p.54-56.

Nash, W.P.

1972: Mineralogy and Petrology of the Iron Hill Carbonatite Complex, Colorado; Geological Society of America, Bulletin, vol.83, p.1361-1382.

Nie, N.H., Hadlaihall, C., Jenkins, J.G., Steinbrenner, K. and Beni, D.H.

1975: Statistical Package for the Social Sciences, 2nd Ed.; McGraw-Hill, 675p.

ODM-GSC

1960: Obabigan Lake; Ontario Department of Mines — Geological Survey of Canada, Aeromagnetic Map 938G, scale 1:63 360.

1970: Albany River; Ontario Department of Mines — Geological Survey of Canada, Aeromagnetic Compilation Map P.578, scale 1:1 013 760.

Parsons, G.E.

1961a: Schryburt Lake Claims, Schryburt Lake Area, Patricia Mining Division, Ontario; *unpublished report prepared for* Many Lakes Exploration Company Limited, 13p.

1961b: Schryburt Lake Carbonatite; *unpublished report prepared for* Many Lakes Exploration Company Limited, 2p.

Sage, R.P. and Wright, W.

1979: Schryburt Lake Carbonatite Complex, District of Kenora; Ontario Geological Survey, Preliminary Map P.2236, Geological Series, Scale 1:15 840 or 1 inch to 1/4 mile. Geology 1976.

Thurston, P.C., Sage, R.P. and Siragusa, G.M.

1971: Winnimun Lake - Big Trout Lake Sheet, Operation Winisk; Ontario Department of Mines and Northern Affairs, Preliminary Map P.712, scale 1:126 720.

1979: Geology of the Winisk Lake Area, District of Kenora, Patricia Portion; Ontario Geological Survey, Report 193, 169p.

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